Rochester Public Library

Pit and Quarry

With which is consolidated

CEMENT-MILL & QUARRY

June, 1933

The Turn Has Come!

WITHIN a few days the administration's program for the control of industry and the construction of $3,300,000,000 worth of public works will have been enacted into law. And within thirty days thereafter many prominent industries will have made a rapid and substantial beginning toward the recovery for which everyone has longed and waited. Within two months at the most more than $100,000,000 worth of aggregates will have begun to flow through the channels of the nonmetallic-mineral industries.

Through this legislation and through the single avenue of public-works construction alone will be created an aggregate market equal in value to half of these industries' total output in the greatest year of their history. To this enormous sum must be added the perhaps equally large total value of the aggregates that will be needed for private construction, spurred on by the swelling wave of public confidence born of reviving business and rising wages and prices. Stock-piles, the bane of the producer's existence in recent years, will dwindle rapidly in the face of the material requirements that will soon be released, for in nearly every state of the union highway programs are being held in abeyance awaiting enactment of the National Industrial Recovery Act.

This is no financial forecaster's dream, but a faithful summary of the prospects. Too many men in all lines of industry are still moping in the shroud of their oft-disillusioned optimism, holding their natural exuberance in check, arguing against the weight of facts, torn between the hope that perhaps after all this may be the dawn and the hope that, if it should prove to be another "fake," they may be the first to cry "I told you so." Of course this attitude is childish and mature men know it. It is the refuge of the man who has played false to his convictions so long that they have at last forsaken him and who, out of fear of moving prematurely, moves not at all.

So, we say, this is the beginning of recovery; this is the time when you must take heart or you will be beyond salvaging. And, make no mistake, this is the time when you must make ready, when you must have done with procrastination, when you must stop dawdling and toying with the economic forces that are swinging into action everywhere around you, when you must begin working if you do not want to be accused of shirking.

There are big orders to be had, but they will not go to the fancy trader of the old school. There will be no price-cutting, no overshipping, no side agreements, no unfair trade practices in this "new deal" for industry. The hours and wages of your workers will be fixed, your production will be limited, the prices at which you can sell will be determined for you, and "no shenanigan." The administration means business and you will be put "on the spot" if you prove to be slow or timid about falling in line.

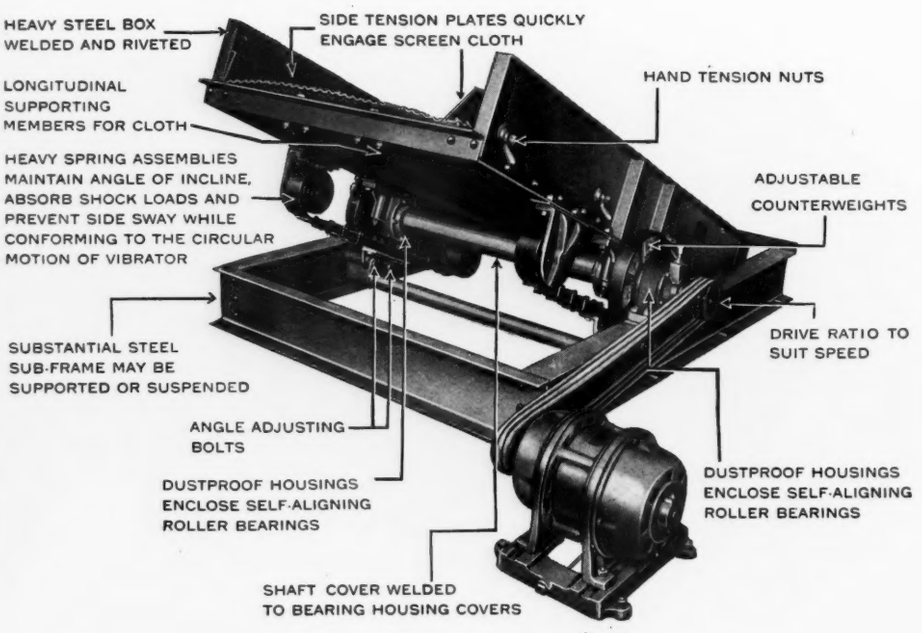
You will be made to think, study and plan as you may never have thought, studied and planned before. And, if you want to make money, you will be forced to use every mental resource at your command, not the old-time cunning and nimble-witted adroitness, but the kind of intelligence that can think its way through when every avenue of escape seems closed.

The new competition will be the stiffest, and perhaps the cleanest, you have ever seen. Some men will shrink from it, are already shrinking from it; there are always some who hate tight rules and fear a fair game. But the majority will rise to the occasion, make their plans now while time remains, and tackle the "new deal" with the intelligence, the determination, and the good grace that alone can insure success. The next move is yours—and don't falter!

★ Pages 11-13

Since September 11, 1929, the largest net paid A. B. C. circulation in the field

The "PD" Heavy Duty Vibrating Screen


HEAVY STEEL BOX WELDED AND RIVETED
SIDE TENSION PLATES QUICKLY ENGAGE SCREEN CLOTH
HAND TENSION NUTS
LONGITUDINAL SUPPORTING MEMBERS FOR CLOTH
HEAVY SPRING ASSEMBLIES MAINTAIN ANGLE OF INCLINE, ABSORB SHOCK LOADS AND PREVENT SIDE SWAY WHILE CONFORMING TO THE CIRCULAR MOTION OF VIBRATOR
ADJUSTABLE COUNTERWEIGHTS
SUBSTANTIAL STEEL SUB-FRAME MAY BE SUPPORTED OR SUSPENDED
DRIVE RATIO TO SUIT SPEED
ANGLE ADJUSTING BOLTS
DUSTPROOF HOUSINGS ENCLOSE SELF-ALIGNING ROLLER BEARINGS
DUSTPROOF HOUSINGS ENCLOSE SELF-ALIGNING ROLLER BEARINGS
SHAFT COVER WELDED TO BEARING HOUSING COVERS

LINK-BELT'S latest contribution to the art of accurately screening sand, gravel, crushed stone, etc.

The "PD" positive eccentric drive vibrating screen offers new economy and reliability in large capacity coarse screening. It is a well designed, heavy-duty unit, with features that reduce power and maintenance costs, and result in a uniform product, with large capacity. Made in convenient sizes, single or multiple screening decks. Send for Book No. 1362, covering the complete line of Link-Belt Vibrating Screens for both fine and coarse screening. Address the nearest office.

LINK-BELT COMPANY

Leading Manufacturers of Equipment for Handling Materials Mechanically and Transmitting Power Positively

CHICAGO PHILADELPHIA INDIANAPOLIS SAN FRANCISCO TORONTO

Offices in all principal cities

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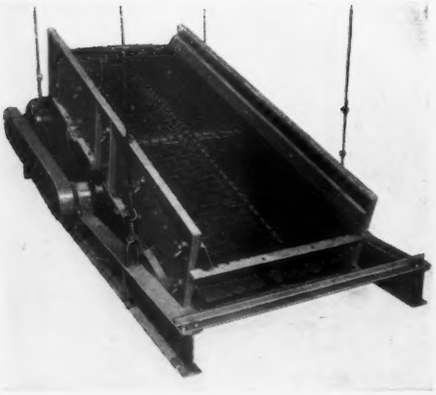
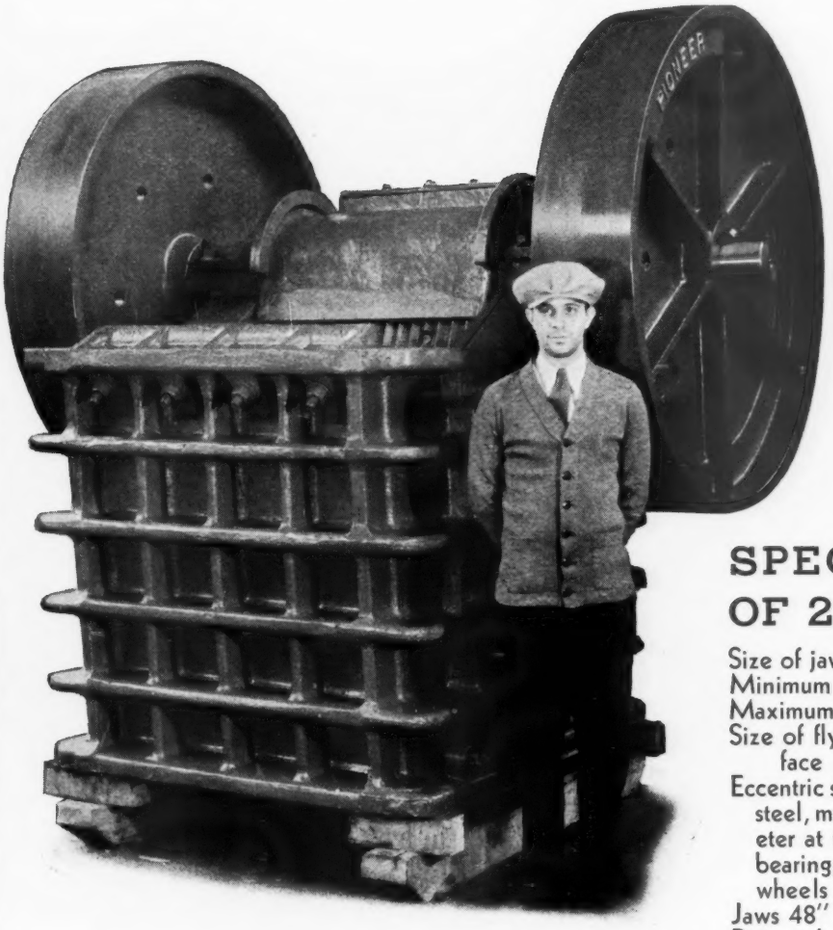


LINK-BELT

Meet the new member to the Pioneer Family



The 2436 Force Feed Jaw Crusher for Primary Crushing

It has been tested and proven and is recommended where large capacity of primary crushing is required.

PIONEER CRUSHERS

Bronze Bearing Crushers . . . . . 8x16 to 24x36
Anti-friction Bearing Crushers . 8x18 to 10x36
Roll Crushers . . . . . 14x24 to 20x40

SPECIFICATIONS OF 2436 CRUSHER

Size of jaw opening—24"x36"
Minimum setting of jaws—3"
Maximum setting of jaws—6"
Size of flywheels, 60" diameter, 12½" face
Eccentric shaft heat treated chrome nickel steel, machined and ground—9" diameter at the center, 7" diameter at the bearing, $5\frac{15}{16}$" diameter at the flywheels
Jaws 48" deep—manganese steel
Base—electric cast steel
Pitman—electric cast steel
Cheek plates—manganese steel
Pitman toggle seat—alloy steel
Toggle plate—cast iron
Adjusting mechanism—fully enclosed ratchet type
Side bearings—bronze, lower half babbitted, caps ring oil
Pitman bearing—bronze, splash oil
Closures — patented Pioneer closures, preventing dirt from getting between the Pitman and main bearings
Total weight—30,000 lbs.

Pioneer Gravel Equipment Mfg. Co.

1519 Central Avenue *AND THERE IS A DEALER NEAR YOU* **Minneapolis, Minn.**

Pit and Quarry

With which is consolidated
CEMENT-MILL & QUARRY

Volume 25 June, 1933 Number 10

MEMBER AUDIT BUREAU OF CIRCULATIONS

Published on the first of each month for producers and manufacturers of Cement, Crushed Stone, Gypsum, Lime, Sand, Gravel and other non-metallic minerals. Entered as second-class matter November 28, 1932, at the Postoffice at Chicago, Ill., under the Act of March 3, 1879.

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H. W. BAUMGARTNER
President

S. A. PHILLIPS
Vice-President and Directing Editor

Field Editor:
W. E. TRAUFFER

Assistant Editor:
HARRY F. UTLEY

News Editor:
C. M. HANCOCK

Production:
W. T. KLUSSMAN

Advertising Manager:
E. M. BUCK

Central Advertising Manager:
W. E. COATES, 1258 Marlowe Ave.
Telephone *LAkewood 1166J*
Lakewood, Ohio

Western Advertising Manager:
W. A. BUSCHMAN
Telephone *HARrison 9357*
Chicago, Ill.

Advertising Representative:
IVER W. LEE, 122 E. 7th St.
Los Angeles, Cal.

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BRING YOUR JOB AND THE RIGHT BELT TOGETHER

A good conveyor belt is only one of the factors for successful handling of any conveying job.

A knowledge of what *the job* calls for is equally important—and should be *built into* the very design and construction of the belt.

Before he recommends any particular conveyor belt, the G.T.M. —Goodyear Technical Man—scientifically studies the job it is to do. Then he knows just what particular construction is best adapted to the specific operating conditions—the necessary thickness and quality of the cover stock—the proper weight of duck—and the right number of plies.

When you get a conveyor belt so specified and built, you get a typical Goodyear Conveyor Belt, and you can put it on your job confident that it will deliver typical Goodyear efficiency, freedom from trouble, and long, economical life.

For better conveyor belt performance at lower per-ton cost, get in touch with the G. T. M.—through Goodyear, Akron, Ohio, or Los Angeles, California, or your nearest Goodyear Mechanical Rubber Goods Distributor.

OTHER G.T.M.-SPECIFIED GOODYEAR PRODUCTS

For Sand and Gravel, Rock and Cement Industries

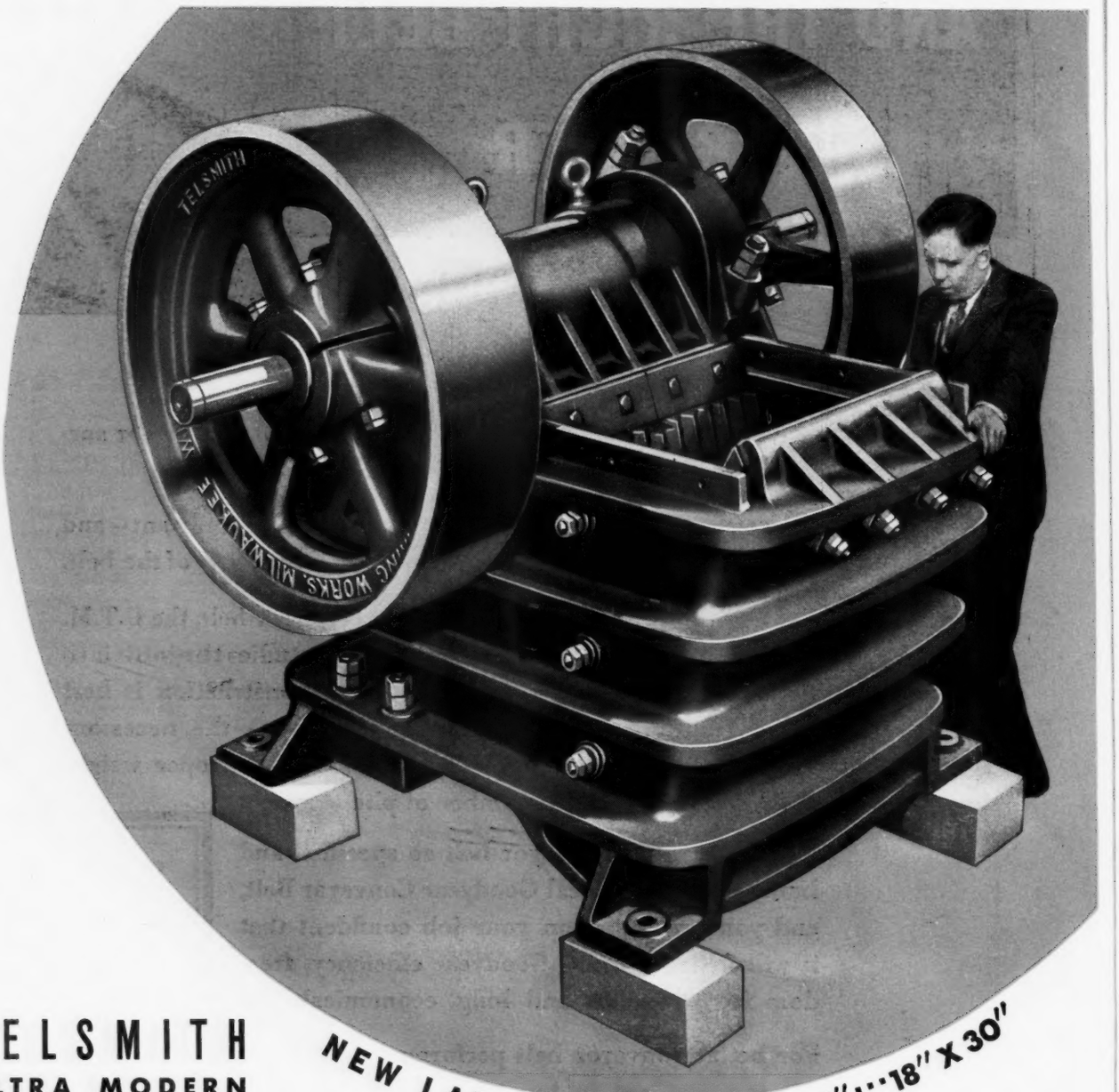
- Sand Suction Hose
- Dredging Sleeves
- Air Hose
- Transmission Belts
- Elevator Belts

THE GREATEST NAME IN RUBBER

GOODYEAR

BELTS • MOLDED GOODS • HOSE • PACKING

Anti-friction Bearings



TELSMITH ULTRA MODERN FEATURES

NEW LARGE SIZES···13″ X 24″···18″ X 30″

- **Both Coarse and Secondary Crusher**—crushes quarry rock to finished size . . . a uniform cubical product . . . in one process.
- **High-Speed Crushing Stroke**—guarantees greater capacities and more uniform product.
- **Easily Accessible**—with cylindrical roller bearings, crusher can be taken apart and reassembled in the field quickly and easily, by average mechanic.
- **Reversible Manganese Steel Die Plates**—stationary and swinging jaw plates are manganese steel, accurately fitted and clamped tightly in place by wedge blocks.
- **Steel Frame**—main structure is annealed cast steel. Machined inside to provide permanently true surfaces for jaw dies, toggle and wedge blocks.
- **Most Effective Crushing Stroke**—particularly in producing smaller sizes, ½″, ¾″ and 1″ rock.
- **Easy Adjustment**—three toggle settings to vary crushing stroke. Wide range of opening provided. Simple, trouble-free adjusting mechanism.

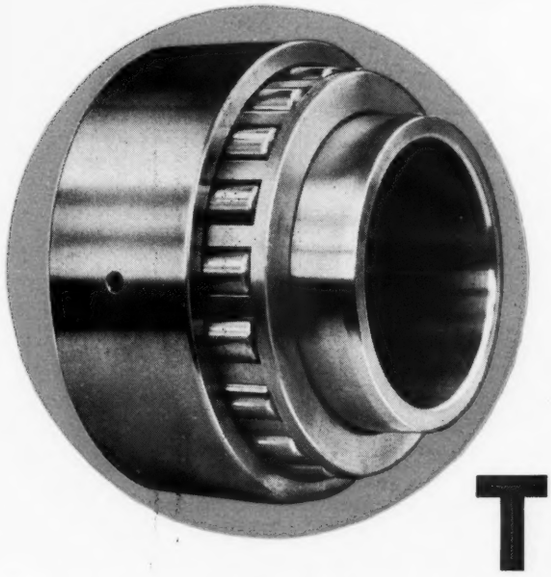
WS-8

Increase the Capacity

- LENGTHEN CRUSHER LIFE
- CUT POWER-PER-TON

Why are modern jaw crushers equipped with roller bearings instead of babbitt or bronze sleeves? Because anti-friction bearings permit faster speed; and greater speed means more crushing strokes per minute, consequently *greater output*. Because roller bearings retain their lubricant longer and reduce the danger of burning out bearings through careless inspection. Because hardened roller bearings prevent deflection and breakage of shafts. Because roller bearings mean reduced frictional loss and less power consumed per ton crushed.

But—*and get this*—there are many kinds of roller bearings—some suitable for light duty and fast speeds, others better adapted to the heavy pressures and constant pound which are unavoidable in crushing hard rock.



In the Telsmith-Wheeling Jaw Crusher, the anti-friction bearings are of the cylindrical type (see picture below) designed particularly for the toughest quarry conditions. The solid steel rollers are made of alloy steel, heat-treated and hardened to the center. Rollers are retained in heavy bronze castings, accurately machined to assure perfect alignment of the rollers. Races are alloy steel, heat-treated and hardened. All bearing assemblies are protected by special piston-ring-labyrinth seals, which both retain lubricant and exclude dirt. Shaft, swinging jaw and all bearings are *assembled as a unit*, which can be readily removed in the field.

This jaw crusher is designed like the power plant of a battle ship. Extra capacity—extra years of service—extra power and maintenance economy—extra satisfaction for the user—they are all built into it, guaranteed by the Telsmith name plate. Write for Bulletin W-15.

SMITH ENGINEERING WORKS
504 EAST CAPITOL DRIVE, MILWAUKEE, WIS.

Canadian Representatives:
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1109 Statler Bldg., Boston, Mass.
607 Westinghouse Bldg., Pittsburgh, Pa.
Milburn Machinery Co., Columbus, Ohio.

TELSMITH
WHEELING JAW CRUSHERS

PLAY *Safe* BY USING

Williamsport Wire Rope !

Don't risk the chances of an accident. Know the quality—the grade of steel that goes into the wire rope you use on dangerous operations.

"Williamsport" is the only wire rope made today that definitely shows by the Telfax Tape Marker the grade of steel and enables you to promptly determine its breaking strength. This is a valuable thing for you, worth more than the Wire Rope costs—

You will find this protection only in Williamsport—the quality wire rope.

And by the way—we are now making "Form-Set" the newest idea in Preformed wire rope.

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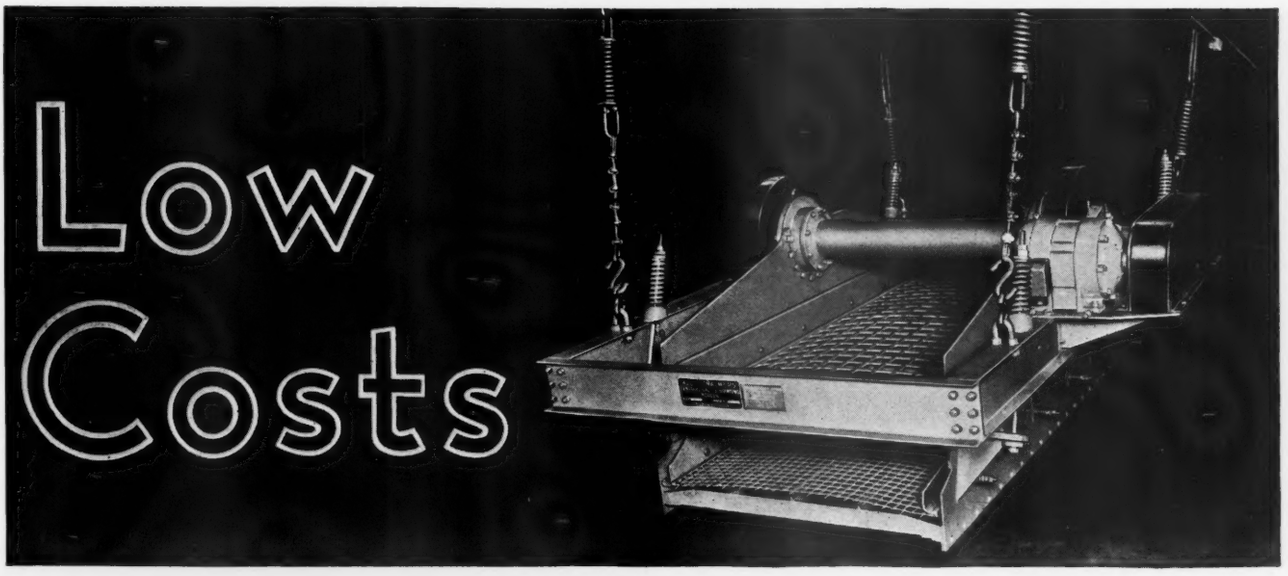
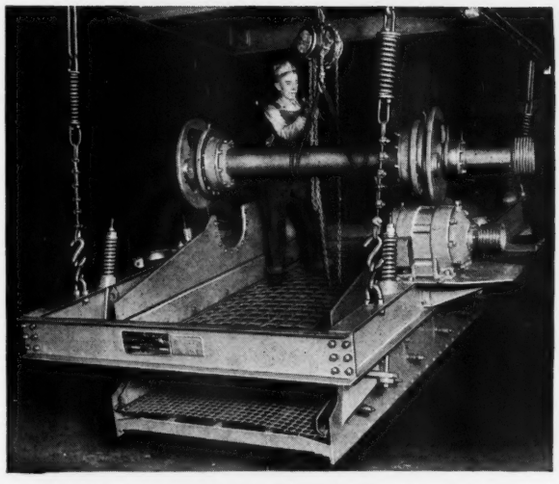
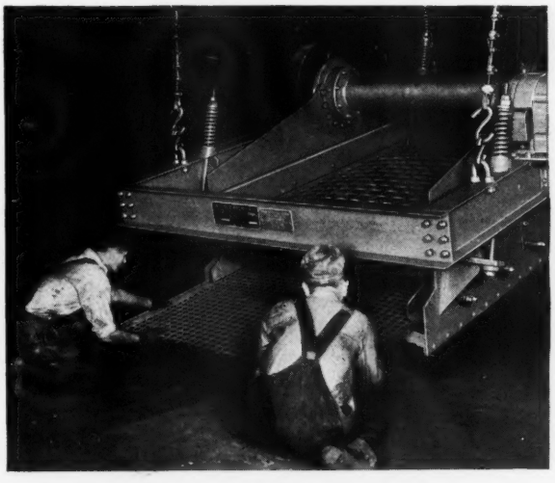




Driving Mechanism is convenient for inspection and is easily removed or replaced



Screen Sections are easily and quickly changed. Liberal clearance between decks facilitates spouting

With New Style B Vibrating Screens

Style B screens are of heavy construction with positive eccentric motion. They are especially suitable for heavy loads and are built in a large range of sizes. . . . The driving mechanism is above the screen convenient for inspection and lubrication. It can be easily removed or replaced. The screen body floats on balance springs reducing power requirements and the load on the bearings. The liberal clearance between decks facilitates spouting, inspection of cloth and changing of screen sections. Screen cloth is held in tension and is reversible. All bearings are of the anti-friction type enclosed in dust-proof housings. All revolving parts are enclosed, protecting workmen and reducing installation expense necessary to meet safety laws. Mechanisms can be rotated in either direction. Screen motor and drive, all built by Allis-Chalmers, are tested as a unit at the factory before shipment. . . . The above features result in a screen of high capacity, uniform product, and low power and maintenance costs.

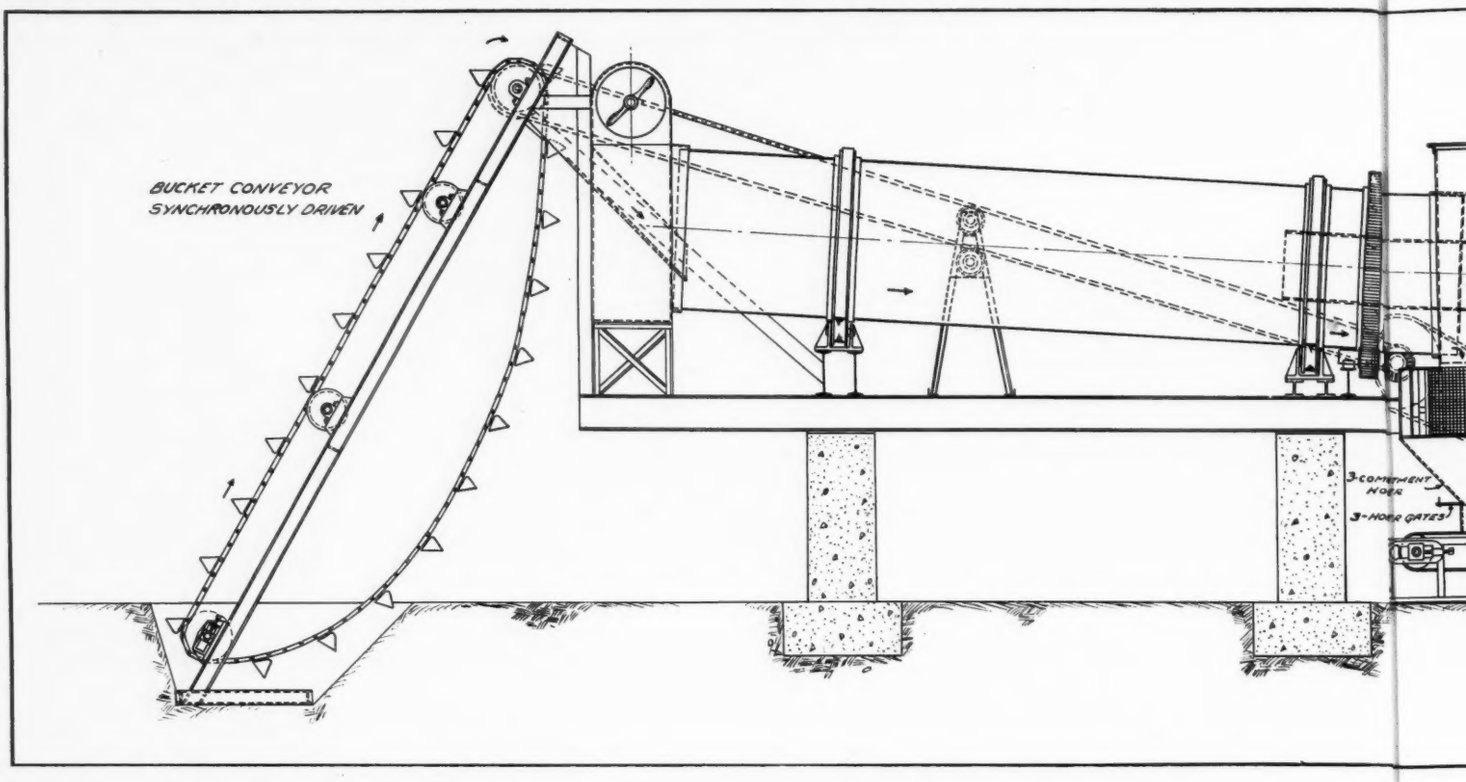
OTHER ALLIS-CHALMERS PRODUCTS

Gyratory Crushers
McCully and Newhouse
Non-Choking Concaves
Jaw and Roll Crushers
Revolving Screens
Vibrating Screens
Scrubbers and Washers
Elevators and Conveyors
Feeders and Bin Gates
Friction and Electric Hoists
Grinding Machinery
Cement Mill Machinery
Mining Machinery
Electric Motors
Gearmotor Units
Texrope V-Belt Drives
Centrifugal Pumps
Air Compressors
Track-type Tractors
Road Machinery
Track-type Wagons
Tunnel Shovels

ALLIS-CHALMERS

Allis-Chalmers Manufacturing Company, Milwaukee

THERE IS A FORTUNE

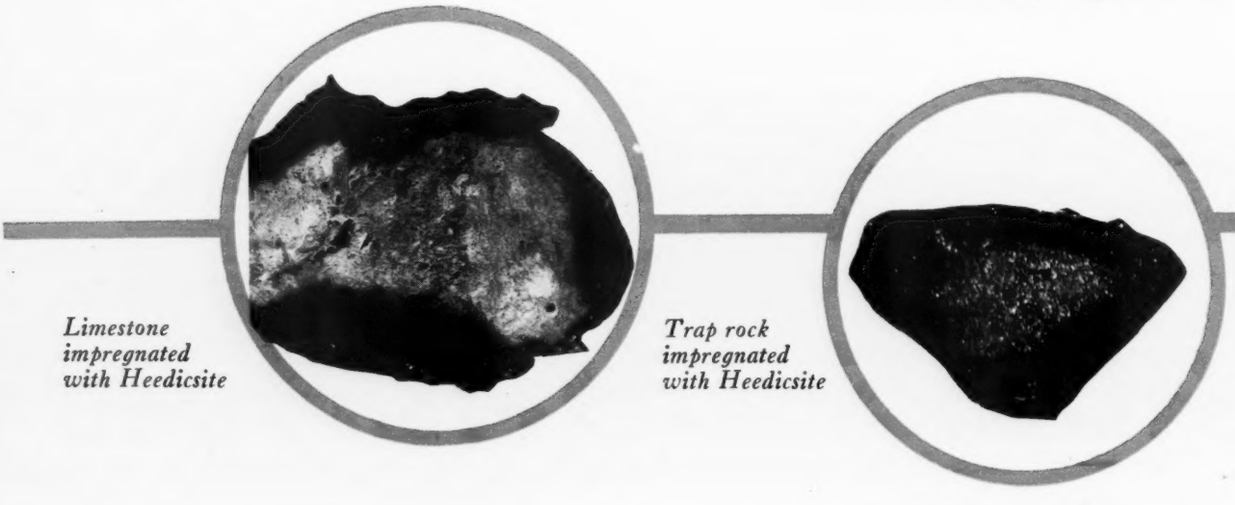


Building secondary roads at low cost is the greatest need in highway expansion today. The public-works bill gives immediate impetus to road construction. If you are alert and want *extra profits,* here's your opportunity.

The alert, profit-seeking producer can now make a new improved bituminous paving mixture at a lower cost than is possible by any of the other existing methods. And the Heedicsite Method is distinctly superior. The product is permanently free from water, penetration is greater and the resulting bond more homogeneous. The system used is automatic and as free as possible from human error. The operation is synchronized throughout so that little attention is necessary after the original adjustments have been made.

Heedicsite-made material is so superior that it not only meets state specifications, but highway engineers who have examined it have given

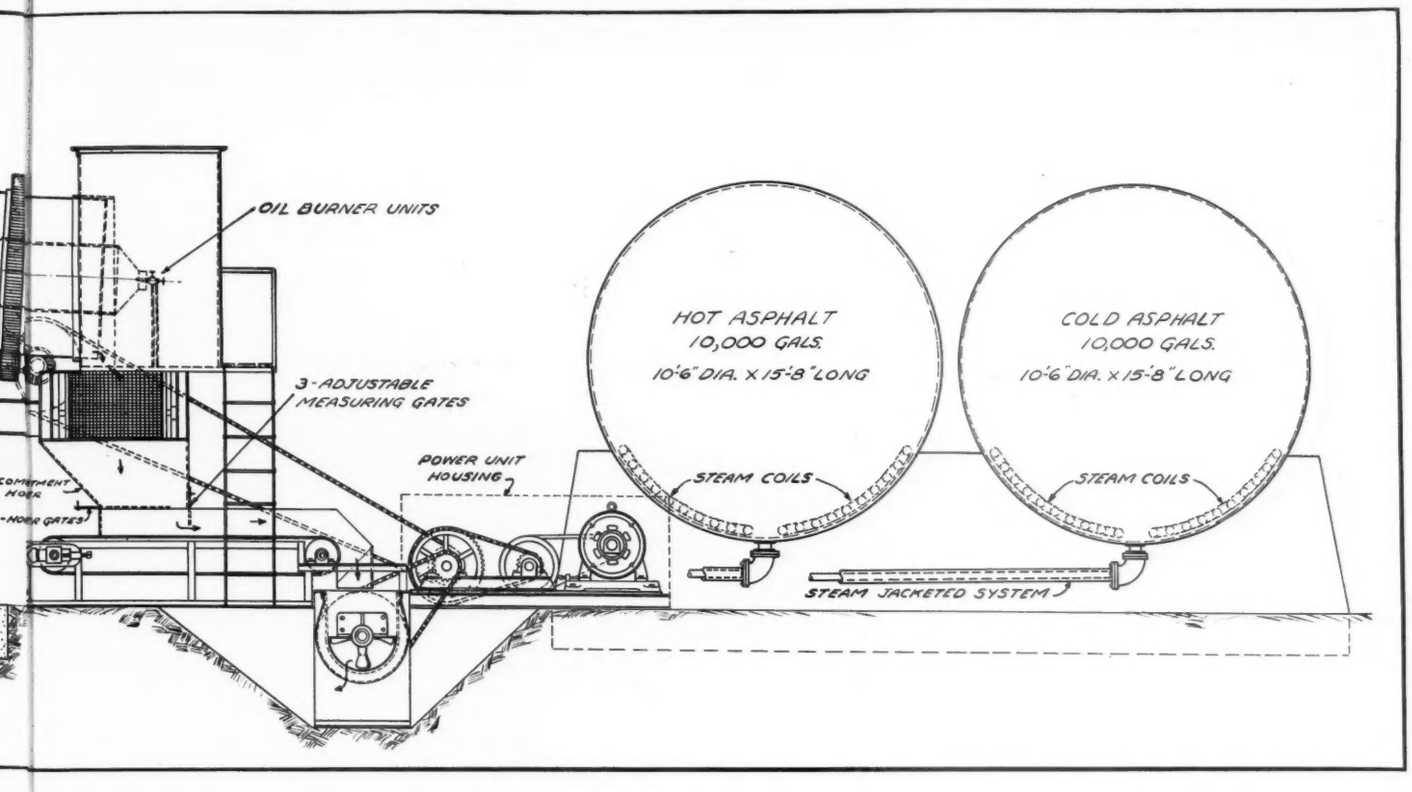
Vacuum impregnation



Limestone impregnated with Heedicsite

Trap rock impregnated with Heedicsite

IN THIS NEW BUSINESS


OIL BURNER UNITS
3-ADJUSTABLE MEASURING GATES
POWER UNIT HOUSING
HOT ASPHALT 10,000 GALS. 10'-6" DIA. X 15'-8" LONG
COLD ASPHALT 10,000 GALS. 10'-6" DIA. X 15'-8" LONG
STEAM COILS
STEAM COILS
STEAM JACKETED SYSTEM

their enthusiastic approval—one of them stating that he would use it without the usual procedure of bidding.

A ready market with a bright future—a low-cost product distinctly superior to all competition—can you ask for a better opportunity? And because of the simplicity of the process the plant costs much less than ordinary plants.

If you are in search of additional outlets for your aggregate and a new channel for more certain profits than you have yet found, get complete details on the Heedicsite Method of impregnating aggregate and the unusual franchise offered—you'll never regret filling out the coupon below.

The Heedicsite Company

Grand Rapids, Michigan

of mineral aggregate

Granite impregnated with Heedicsite

The Heedicsite Company
Grand Rapids, Michigan

Send me complete details regarding the Heedicsite Method and your franchise.

NAME .....

COMPANY .....

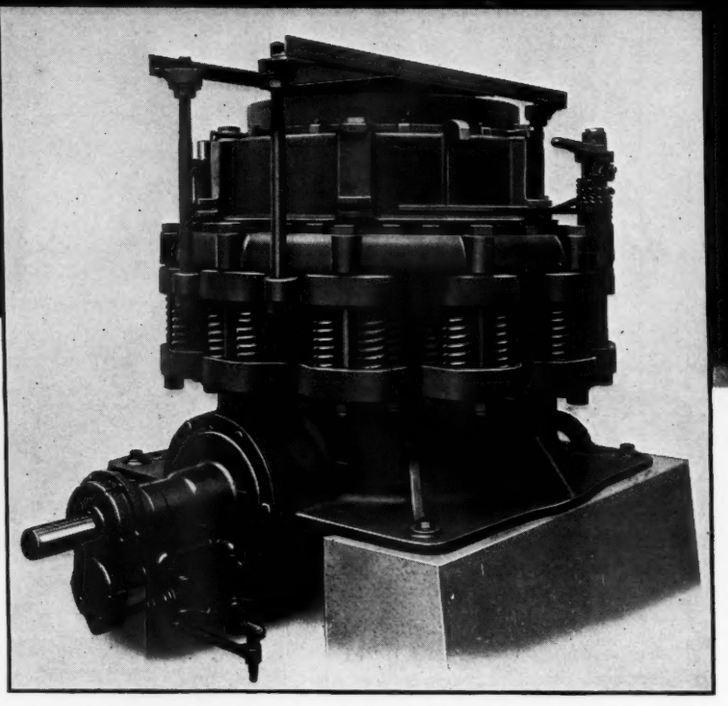
STREET .....

CITY ..... STATE .....

Reduce that fine crushing cost

with a

SYMONS SHORT HEAD Cone Crusher



Features of the SHORT HEAD CONE

●

Steeper angle allows material to pass through crushing cavity at higher speed, greatly increasing the capacity . . .

Enlarged diameter of head with greater area at intake opening increases the effective crushing area at the top where much of the initial crushing is done . . .

The wide travel of the head creates a big discharge opening around the entire bottom thus permitting free and rapid exit of crushed fines . . .

Incoming material evenly distributed around the entire intake opening assuring most efficient crushing action . . .

Long parallel zone assures uniform sizing.

In these days, every producer of crushed materials must carefully consider his crushing costs. This is especially true where finer products are demanded such as the materials required for the top dressing of black top and similarly surfaced roads. This new Symons Short Head Fine Reduction Crusher was developed primarily to produce this and even finer materials in greater quantity and at a cost far below that heretofore possible with any other equipment.

If you are faced with the need of furnishing such materials, let Nordberg tell you about the possibilities of this new Crusher.

NORDBERG MFG. CO.

Milwaukee, Wis., U. S. A.

NEW YORK
60 E. 42nd St.

LONDON
Bush House

LOS ANGELES
Subway Term. Bldg.

NORDBERG

VOLUME 25 NUMBER 10

Pit and Quarry

With which is consolidated

CEMENT-MILL & QUARRY

CHICAGO, JUNE, 1933

Cement Controversy in Illinois Near End

STATE MAY BUY ON OPEN MARKET

The long-drawn out war between the cement producers operating plants in Illinois and Gov. Horner of that state over cement prices finally seems to be in its last stages. The state legislature has passed the Sinnett bill, which authorizes the division of highways to buy cement on the open market without receiving any more bids in 1933, and the governor has signed it.

This delay in the purchase of the state's 3,300,000 bbl. cement requirements for the year has resulted in the holding up of all state highway construction work for a period of more than two months. As this work forms an important part of the consumption of cement, sand and gravel, and crushed stone in Illinois all of these industries have been operating at considerably less than the normal capacity for this time of the year. According to Senator N. M. Mason of Oglesby, in whose district 90 per cent. of the state's cement is produced, resumption of cement buying by the state will put 30,000 men back to work in the cement, coal and allied industries.

New York Firm Builds Sand-and-Gravel Plant

★ The Carthage Sand Co., Carthage, N. Y., has installed a modern sand and gravel plant near that city. The plant was designed and the equipment furnished by the Kennedy Van Saun Mfg. and Eng. Co. The pit has been tested by the state and contains a high grade of sand and gravel. Orin Clark is general manager of the company.

Springer Stone Co. Makes Extensive Improvements

★ The Springer Stone Co., Schenectady, N. Y., is making extensive improvements to its crushed stone plant. Among the equipment purchased were four belt conveyors ranging from 29 to 160 ft. in length and with widths, respectively of 18, 20, 24 and 30 in. Included also were two double-deck 4-ft. by 6-ft., 6-in., one triple-deck 4-ft. by 8-ft. 6-in., and one single-deck 3-ft. 6-in. by 5-ft. Gyrex screens. All of the above equipment was furnished by the Robins Conveying Belt Co.

Lime Plants Busy in Bellefonte District

That the lime industry is also showing signs of improvement is evident from reports received from Bellefonte, Pa., and vicinity. The Whiterock Quarries, Inc., have all their 18 kilns in operation with a full crew of 170 men working 7 hours per day. The Chemical Lime Co. has 13 of its 16 kilns in operation and about 175 men working. The American Lime & Stone Co. also reports an improvement in business and has about 200 employees working.

Indiana Stone Plant Adds New Equipment

★ The firm of Harding & Sims, Shoals, Ind., recently revamped its crushed stone plant. Improvements included a new bucket elevator and secondary crusher and the old screening equipment was replaced with a double-deck 4-ft. by 6-ft. Deister Plat-O vibrating screen.

Use of Imported Cement Barred by New York City

The board of estimate and apportionment has barred the purchase and use of imported cement for New York City projects. This action was taken over the protests of representatives of several importing companies.

New Wisconsin Aggregate Association Is Formed

The Wisconsin Materials Assn., Inc., Room 4035, Plankinton Bldg., 161 West Wisconsin Ave., Milwaukee, Wis., has been organized to take the place of the former Wisconsin Mineral Aggregates Ass'n.

★ The Suffern Stone Co., Suffern, N. Y., recently made improvements which included the installation of a 5-ft. by 14-ft., four-deck Robins Gyrex screen.

Conditions in Cement Industry Improving

MANY PLANTS RESUME ACTIVITY

Many Portland cement plants have recently resumed operations after having been shut down for periods varying from a few weeks to several months. These include the following: Universal Atlas Cement Co., Buffington, Ind., Duluth, Minn., Hudson, N. Y., and Universal, Pa.; Aetna Portland Cement Co., Fenton, Mich.; West Penn Cement Co., West Winfield, Pa.; Medusa Portland Cement Co., Bay Bridge, O.; Cumberland Portland Cement Co., Cowan, Tenn.; Lawrence Portland Cement Co., Siegfried, Pa.; Bessemer Limestone & Cement Co., Walford Sta., Pa.; Signal Mountain Portland Cement Co., Chattanooga, Tenn.; Alpha Portland Cement Co., Manheim, W. Va.; Pennsylvania-Dixie Cement Corp., Nazareth, Pa., and Portland Point, N. Y.

Plant Changes Made by Silica Co. of Cal., Ltd.

★ The Silica Co. of Cal., Ltd., has inaugurated an expansion program involving more than $25,000 at its plant near Brentwood, Cal., according to K. G. Schweglen, general manager. This program, which follows more than four years of experimental activity, was made necessary largely by increased demand by bottle manufacturers. The principal improvement is the installation of facilities for dry screening.

Borrman Stone Products Now Northern Quarries

Borrman Stone Products, Inc., Norwood, N. Y., at a recent directors meeting changed its name to Northern Quarries, Inc. All of the officers were reelected for the coming year and there is no change in the ownership and management of the company.

★ The Mausdale Quarry Co., Danville, Pa., has leased property near Williamsport and erected a permanent crushed stone plant with a capacity of 500 tons per day.

Midwest Agstone Men Ask Freight Rate Cut

FARM BUREAUS BACK PETITION

The Midwest Agricultural Limestone Institute, 1612 Syndicate Trust Bldg., St. Louis, Mo., recently presented a petition to railroads operating in the states of Illinois, Indiana, Iowa, Missouri and Wisconsin, asking for a reduction of 25 per cent. in the freight rates on agricultural limestone. The petition claims that in spite of price reductions at the quarries, the farmers receive little benefit as the freight charges represent a large portion of the cost to them. According to the petition, the use of agricultural limestone in Illinois decreased from 925,000 tons in 1929 to 140,000 tons in 1932 and this decrease was general in the other states mentioned. E. J. Krause, president of the Columbia Quarry Co., is chairman of the Midwest Agricultural Limestone Institute. Before being presented the petition was circulated among the farm bureau federations of the above five states and is endorsed by them.

Oklahoma Glass-Sand Plant Adds Equipment

★ The Mid-Continental Glass Sand Co., Roff, Okla., has completed an improvement program at its plant in that city. Among the improvements was the replacement of an old rotary screen with a new Universal vibrating screen.

Federal Barge Line Extension Approved

Extension of the Federal barge line service to Chicago has been approved by George H. Dern, secretary of war, service to begin about July 1. The present limit of barge operations is Peoria, Ill.

Western Asbestos Mine To Be Operating Soon

★ The United States Asbestos Corp., Ltd., is developing a new mine a few miles south of Monticello, Cal. Two 200-hp. electric motors have already been installed in the mine and the plant is expected to be in operation early in June.

Elmhurst-Chicago Stone Celebrates Anniversary

The Elmhurst-Chicago Stone Co., Elmhurst, Ill., one of the pioneer industries in that vicinity, celebrated its fiftieth anniversary on May 13. An invitation was extended to all business acquaintances and friends to attend the open-house festivities which were arranged to commemorate the occasion.

In 1883 Adolph Hammerschmidt and Henry Assman went into the quarrying business on the present site. Ten years later Mr. Hammerschmidt bought out the interest of Mr. Assman and the company was incorporated with Adolph Hammerschmidt as president, William Hammerschmidt as vice-president and F. W. M. Hammerschmidt as secretary and treasurer. Since that time the ownership of the company has remained in the hands of the same family although none of the founders of the company remain. The present officers are: Richard Hammerschmidt, president; George Hammerschmidt, vice-president; Martin Hammerschmidt, treasurer; Lydia Hammerschmidt, secretary. In 1929 the plant was completely rebuilt and a complete description was published in PIT AND QUARRY shortly afterward.

Trucks Replace Tracks in Indiana Stone Plant

★ The Heller Stone Co., Bluffton, Ind., recently completed a number of improvements including the replacement of track haulage in the quarry with trucks and the replacement of a rotary screen in the plant with one of the vibrating type.

Engineering Week to Draw Many Visitors

Plans for the huge conference of engineers at Chicago, during Engineering Week, June 25 to 30, sponsored by the Century of Progress Exposition, are making progress. Engineers in the quarry and cement field will be particularly interested in the sessions of the American Society of Mechanical Engineers, the American Ceramics Society, the American Institute of Architects and the American Institute of Electrical Engineers. Some twenty of the national engineering societies will also participate with sectional and national meetings.

In addition to the many interesting educational exhibits at the Century of Progress Exposition, engineers of the pit-and-quarry industries will also see much of value at the Sixth Midwestern Engineering and Power Exposition, to be held during that week. Some 300 manufacturers will show the latest developments in steam-generating equipment for power and heating purposes. In addition there will be a wide range of equipment such as material-handling machinery, Diesel engines, pumps, electrical apparatus, etc.

The combined membership of the engineering groups participating in Engineering Week is 91,600. Preliminary estimates of attendance indicate the largest gathering of engineers in history.

The Power Show was originally scheduled to be held at the Coliseum but will be transferred to the exhibition hall of the Stevens Hotel, which will be the center of activities for Engineering Week at the Century of Progress Exposition.

Production of Pig Iron and Cement Compared

CEMENT HIT LESS BY DEPRESSION

In an article recently published in "Manufacturers Record," Edwin C. Eckel, consulting geologist of Washington, D. C., made an interesting comparison between the relative growths in the consumption of iron and cement. He showed that the cement industry passed the iron industry in tonnage output during the depression, not because it grew more rapidly, but because it fell off less during the past two years of retrogression in all industries. In a table representing production of these materials in critical years since 1875 Mr. Eckel shows that 21,000,000 long tons of cement were produced in 1931 and 13,000,000 tons in 1932, compared with 17,958,000 tons of pig iron in 1931 and 8,750,000 tons in 1932.

Hugo Sand Co. Completes Several Improvements

★ The Hugo Sand Co. has just completed the erection of a new office building at its plant at Kent, O. A new 20-ton capacity Standard platform scale has been installed to weigh truck shipments. A new dredge pipeline 10-in. in diameter and 900-ft. long has also been installed.

Michigan Lime Plant Is Destroyed by Fire

The lime plant of the Campbell Stone Co., at Afton, Mich., burned to the ground the night of May 22 at an estimated loss of about $100,000. The plant had only been running about 12 hours after a long shutdown when the blaze broke out.

Rebuilding of the plant has already begun. The hydrating and crushed stone plants were not damaged.

Kingston Trap Rock Co. Is Building New Plant

★ The Kingston Trap Rock Co., Plainfield, N. J., has under construction a new crushed stone plant with a crushing capacity of 475 tons per hour and screening storage and loading capacity of 275 tons per hour. Five belt conveyors 24, 30 and 36-in. wide, and three 5-ft. by 12-ft. Gyrex screens are included in this equipment which was furnished by the Robins Conveying Belt Co.

Build Asphalt Plant at France Stone Co. Quarry

★ The West Process Paving Co. has a new asphalt plant under construction at the crushed stone plant of the France Stone Co., Bloomville, O. F. H. Donaldson is in charge.

Collect Half Billion in Gas Taxes in 1932

GASOLINE CONSUMPTION LESS

State gasoline and motor-fuel taxes and licenses for the sale of gasoline yielded a total revenue of more than $514,000,000 in 1932 according to reports collected from state authorities by the Bureau of Public Roads, U. S. Department of Agriculture. More than 14,000,000,000 gal. furnished power for motor vehicles. The tax was at an average rate of 3.6 c. per gal. The consumption of gasoline declined 7.5 per cent. from the previous year. Delaware and Maryland were the only states reporting increased consumption.

The total revenue was allocated as follows: To state highways, $301,788,231; to local roads, $94,073,954; to state and county road bond payments, $50,726,362; to city streets, $16,776,050; to costs of collection and administration, $2,832,820; and to other than highway purposes, $47,941,483.

The gasoline-tax revenue by states was as follows:

State	Total Tax Receipts (refunds deducted)	Tax Rate on Dec. 31, (*cents*)	Net Gallons Taxed	Increase (+) or Decrease (—) in Consumption from 1931 (*per cent*)
Ala.	$ 7,001,088	6	136,421,624	—16.1
Ariz.	2,900,920	5	58,004,441	—10.4
Ark.	5,164,976	6	86,082,940	—22.2
Cal.	36,128,854	3	1,204,295,149	— 9.4
Colo.	5,469,220	4	136,730,489	—12.6
Conn.	4,732,512	2	234,229,379	— 0.9
Dela.	1,090,150	3	36,338,331	+ 1.7
Fla.	14,531,707	7	207,268,239	—11.8
Ga.	11,938,809	6	198,980,154	—10.3
Ida.	2,287,295	5	45,554,550	—12.3
Ill.	28,754,051	3	958,468,356	— 1.1
Ind.	16,739,604	4	418,489,040	— 7.2
Ia.	8,970,137	3	299,004,568	—17.9
Kan.	7,420,495	3	247,349,852	— 8.1
Ky.	8,206,105	5	164,057,785	— 6.9
La.	8,300,722	5	166,014,436	—11.7
Me.	4,254,376	4	105,167,540	— 4.0
Md.	7,500,232	4	187,505,794	+ 0.9
Mass.	16,519,278	3	550,642,607	— 1.4
Mich.	20,460,611	3	681,044,263	— 6.4
Minn.	10,000,557	3	333,351,913	— 9.7
Miss.	5,843,750	6	96,732,445	—16.4
Mo.	8,949,693	2	447,484,670	— 2.8
Mont.	2,690,156	5	53,803,120	—10.9
Neb.	7,809,465	4	195,236,623	—14.1
Nev.	727,117	4	18,177,920	— 6.5
N. H.	2,638,841	4	65,971,040	— 0.7
N. J.	16,674,671	3	553,914,175	— 3.0
N. M.	2,210,502	5	43,845,055	—17.7
N. Y.	42,580,593	3	1,485,127,929	— 2.8
N. C.	13,907,377	6	231,727,434	— 7.2
N. D.	1,837,151	3	61,190,398	— 9.6
O.	34,269,179	4	856,729,484	—12.9
Okla.	9,682,442	4	241,527,434	— 4.3
Ore.	5,591,175	4	140,066,134	— 9.7
Pa.	30,800,915	3	1,009,663,827	— 6.7
R. I.	1,857,711	2	92,701,236	— 2.0
S. C.	6,224,927	6	103,748,781	—14.1
S. D.	2,963,348	4	74,083,694	—12.7
Tenn.	12,185,360	7	174,076,575	—15.8
Tex.	27,063,758	4	676,593,941	—11.3
Utah	2,172,669	4	54,297,788	—10.0
Vt.	1,874,648	4	46,866,212	— 4.7
Va.	10,809,600	5	216,191,996	— 5.6
Wash.	11,046,510	5	220,930,195	— 9.7
W. Va.	4,949,400	4	123,544,775	— 8.3
Wis.	14,948,420	4	373,710,495	—13.4
Wyo.	1,418,145	4	35,453,612	—10.6
D. of Col.	2,039,678	2	101,774,858	+17.9
Total	$514,138,900		14,250,173,296	— 7.5

[1]Includes approximately 2,294,022 gal. of "distillate" at 3½-c. tax.

Gravel Dredge Suffers $40,000 Damage by Fire

The dredge boat "Marion," owned by the C. M. Johnson Sand & Gravel Co. of Helena, Ark., was recently destroyed by fire while operating in the vicinity of Friar Point, Miss. The loss, estimated at $40,000, was partly covered by insurance.

$250,000 Canadian Plant Now Under Construction

★ National Silicates, Ltd., has commenced construction of its $250,000 plant at West Toronto, Ont., Can., and expects to have it in operation by the end of the year. This company is owned jointly by the Philadelphia Quartz Co. and G. F. Sterne & Sons, Ltd., Brantford, Ont., who previous to this incorporation were distributors of P. Q. products in eastern Canada.

Micolithic Co. Sold to Rio Grande Quarries Co.

The Rio Grande Quarries Co., Houston, Tex., has taken over all of the real estate and other assets formerly owned by the Micolithic Co. of Texas. Operations will be continued by the new owners at the quarries at Van Horn, Tex., the principal products being pink and white feldspar, biotite, hornblend, garnets, flake and sheet mica, etc.

Kansas Producer Adds New Primary Crusher

★ R. R. Hardman, Parsons, Kans., recently installed the latest type of McLanahan & Stone Steelstrut primary crusher in his crushed stone plant in that city.

Nat'l Lime Assn. Decides to Postpone Convention

The Fifteenth Annual Meeting of the National Lime Assn., originally scheduled to be held in Atlantic City, May 23 and 24, has been postponed until about June 15. The reason given by Norman G. Hough, president and general manager of the association, for this postponement is that it will give members an opportunity to take advantage of new legislation now before Congress which will probably be determined before the new date set.

Buffalo Crushed-Stone Plant Nears Completion

★ The Buffalo Crushed Stone Co., Buffalo, N. Y., is installing a 36-in. and a 42-in. belt conveyor and two double-deck 5-ft. by 10-ft. Gyrex screens in its new plant in that city. All of this equipment was furnished by the Robins Conveying Belt Co.

Mineral Production Lower in Michigan

CEMENT LEADS NONMETALLICS

Minerals and mineral products produced in Michigan in 1931, the last year for which figures are available, reached a total valuation of about $83,000,000, a drop of $43,000,000 under the 1930 figure, according to a summary report issued by the geological survey division of the department of conservation. Portland cement, which had a value of over $20,000,000 in 1927, dropped off to less than $7,000,000 in 1931. Only 6,132,000 bbl. were produced in that year. The 1931 values of other products were: Limestone, $3,805,000; sand and gravel, $3,361,000; lime, $334,015; salt, $5,760,000.

Louisiana Lime Plant Is Nearing Completion

★ The new plant of the Louisiana Lime Products Corp., Shreveport, La., is now nearing completion. The Allis-Chalmers Mfg. Co., furnished most of the equipment for this plant, including a bucket elevator, a 4-ft. by 8-ft. triple-deck vibrating screen, bin gates, a bar grizzly, a No. 2 Pulverator, and a Jeffrey belt conveyor and elevator. Allis-Chalmers electric motors and Texrope drives are also used.

Burbank Rock Products Obtains an Injunction

The Burbank Rock Products Co., Los Angeles, Cal., has obtained a permanent injunction restraining the city from interfering with the operation of its sand and gravel pit in the Pacoima Wash area. This injunction prevents the city from enforcing an ordinance establishing two parcels of land now being excavated by the company in a residence zone. The company declares that it has invested over $230,000 in its plant.

Indiana Gravel Plant Has New Diesel Dredge

★ The White River Materials Co., Hazelton, Ind., recently put into operation a new gravel dredge. The hull is 24 ft. wide and 60 ft. long and the pump is driven by a new 140-hp. Diesel engine. Part of the equipment on this dredge was taken from an older dredge formerly used by the company.

★ The Canadian Kaolin Silica Products Co. recently installed a Hardinge Class XA-8 drier and an 8-ft. by 36-in. pebble mill of the same make together with air separators and other equipment.

Editorials

Controlled Industrial Recovery

PASSAGE of the National Industrial Recovery Act, now a practical certainty, presents new problems to industry of all kinds. It introduces into the theory of business enterprise new restrictions, new checks, and new obligations formulated in the interest of the general good. Modern governments are theoretically the servants of the people and in discharging the functions which the principles of political science give to them they must necessarily become increasingly paternalistic as their conception of these obligations broadens and their powers are increased. Whether these newer responsibilities will be honorably discharged remains, of course, to be seen, but there is no good reason for supposing that modern governments will neglect them or abuse their privileges to any greater extent than they did those given them by a less advanced code of political duties. The opportunities for corruption will naturally be multiplied as government services and government jobs increase in number, but it does not necessarily follow that the lure of dishonesty will be any more potent or that it will penetrate any farther into the body politic.

Yet these fears were an important factor in bringing about the temporary revolt of the Senate committee when it voted to eliminate the teeth of the administration's industry-control bill. Wholly apart from any selfish regard for the opinion or wishes of "big business," there was undoubtedly among its members a strong and sincere belief that the bill sought to clothe the government with new and dangerous powers and that, as a people, we were on the verge of an era of reckless political experimentation. In reversing its action and in deciding to report the bill in its original form the committee showed not only a desire to complete its business within the time available but also, let us hope, a more reasoned attitude, the result of more mature consideration and judgment.

It was to be expected that the industry-control features of the bill would arouse suspicion and antagonism. The American people enjoy a fairly large degree of personal liberty and they have carried this principle of freedom of conduct into the realm of business enterprise. The transfer has in fact strengthened, rather than weakened, this sense of individual prerogative, with the result that in recent years business has too often and too glaringly shown its disregard for anything but the interests of its owners. This may or may not present a moral or an ethical problem, but there is little cause for doubting that it favored the growth of conditions which were greatly aggravated and prolonged by the recent slump in trade. It is to prevent a recurrence of such a situation that the administration's industry-control bill was devised.

The ethical justification underlying the bill—and its defenders as well as its opponents realize that it must have some such foundation—is the theory that under modern conditions all businesses are, although in different degrees, "charged with public interest." This belief, based at one time solely on the principle that a business serving the public must show a regard for the interests of the public, has been strengthened in the last two decades by consideration for the public as a stock- and bond-holder in business corporations. The public is thus held to be entitled to greater consideration and protection than formerly, as the supporter of business through its power to purchase industry's products and as a part owner of business through the investment of its surplus income in it.

Combining the theories that the government is the servant and protector of the people and that business exists in order to serve, rather than to be served by, the people, it is not difficult to make a very formidable case for government control of industry. Both theories have been gaining acceptance in the last forty years and more rapidly since the war, for in later years it has become increasingly evident that business, conceived as a means for individual aggrandizement, could not be depended on to show much regard for the public good. The common-law precept of *caveat emptor,* born of an age when the buyer knew almost as much about what he bought as the seller who sold it, has been too generally relied upon as the protecting screen for sharp practice. Under modern conditions the manufacturer possesses what is virtually a monopoly of the knowledge concerning his products and most buyers of every-day commodities know practically nothing about their nature or worth. Coupled with the tremendous growth in all forms of advertising and the increasing reliance upon the attractiveness of color and form, rather than intrinsic value, as appeals for the buyer's favor, the extent of his knowledge of what he buys is continually decreasing. The knowledge necessary for intelligent buying is not only not made available to him, it is deliberately concealed from him by diverting his attention and interest from consequential matters to inconsequential matters, from points of physical worth to the "intangibles."

This policy of "letting the buyer beware" was so eagerly seized upon by business men generally that business was forced to adopt laboratory tests and the specification method of buying in order to protect itself from itself. There was no other way of guarding against misrepresentation and substitution with resulting financial loss and damage to reputation. But to the individual buyer and the small business man no such methods were available and both types of buyer continued to be exploited

by the kind of business men who thought more of immediate gain than of long-time good-will.

Competition for the buyer's business thus centered more and more on points that had no relation whatever to quality, until, under the pressure of the last few years, price became in many cases the deciding factor. This led inevitably to widespread price-cutting and the state of demoralization which has characterized business since 1930.

Despite the fact that conditions in business have become intolerable, even to business men themselves, there has been too much fear of the changes which the National Industrial Recovery Act would bring about. The most that can be said truthfully about these changes is that they promise to substitute order for chaos, some degree of certainty for absolute uncertainty, a reasonable amount of stability in prices and wages for complete demoralization, a theoretically fair allocation and limitation of production for the haphazard methods that have prevailed, and a centrally-planned and centrally-directed control for individual, hour-to-hour expediency. But in addition to these changes there is the one that will be made in many going businesses—from the profit-seeking methods of the sharpshooter to those of the intelligent producer. With government regulation of the hours, compensation and working conditions of labor, of the distribution and amount of production, and of the selling prices of products of all kinds at points above the cost of production, it will be incumbent on producers to delve more deeply than ever before into the processes of production. The size of the producer's profit will depend on his ability to lower the cost of production, not through the old methods of reducing the wages, increasing the hours, and worsening the working conditions of labor, increasing production in order to reduce prices and cutting prices in order to increase production, but through the improvement of his processes by the adoption of better machinery and the elimination of needless motions and methods.

The industrial-control act should in this way be of inestimable help to business, because every form of business has acquired and retained habits and methods that can not justify themselves economically, that can not survive, under a scheme where profits may be smaller and will certainly be harder to win, when so many of the former means will be outlawed. We think it will have a tonic effect on all business, once the hysteria of the moment has subsided under the calming effect of reviving trade. Almost from the minute that the act becomes law its influence will be felt in many lines of industry, and, judging by the dispatch with which the administration has made other phases of its legislative program effective, it should not be long before the benefits will permeate every line of business.

The administration's program for industrial recovery has seemed to many to be a program for industrial destruction. That is largely because they could not visualize profitable business under the restrictions which the act would impose. Individual initiative will not be killed, it will not even be stifled, by the contemplated industrial control. But it will be restricted in its operations; it will not be allowed to run rampant throughout the length and breadth of industry, exploiting and destroying industry itself. It will be held within the limits of common sense and mutual dependence and responsibility, very much in the position to which intelligent trade-association executives would have confined it, had they had the power.

We see no cause for anxiety in the program of the National Industrial Recovery Act. On the contrary, we believe it will have a wholesome effect on every type of business. By eliminating or at least restricting the practices that have brought business to its present state it will perform a great service to industry and to the public which supports industry. It merely promises to do some of the many things which intelligent, farsighted business men have long wanted, but have always been unable, to do themselves. Industry has not been able to correct its own defects, to eliminate the practices which it has recognized as responsible for most of its difficulties, so government, with an eye to the interests of the public as well as those of industry itself, is ready to step in and take the responsibility. Besides accomplishing what so many have wanted to see done, the government's plan will bring centralization of planning and control, plus the power of authority, whereas, were industry to attempt the job, there would be diversity and confusion of plans, division of responsibility, and a lack of power to enforce decisions. The gains appear to us to be well worth whatever sacrifice of individual initiative is involved.

Cement and the Politicians

AS a political football, the cement industry is becoming a strong rival of the public utilities. In the hands of professional politicians it is being libeled and persecuted as the others have been, but, it seems to us, with much less justification and with much less show of pretended fairness.

Politicians who depend for their jobs on the applause of the multitude are making great pretenses these days of being the friends of the people. Feigning an interest in economical spending of the public's money, they have set up a nation-wide clamor against the cement manufacturers because these have seen fit to raise their prices above those quoted in the last two years. No notice is apparently taken, certainly nothing has been said openly, of the fact that these same companies' bid prices were much higher in the preceding twelve years, 1919 to 1930, inclusive, and that the new bids really represent a decline from the average of recent years. Neither is anything said of the fact that, because the manufacturers were foolish enough to bid lower than profit-making levels in 1931 and 1932, the politicians are now attempting to penalize them for their past folly.

The passage of the public-works bill should put an end to this insincere talk of public economy by forcing the states to buy cement at once in order to avail themselves of government help. Surely the intelligent part of the public is already tired of it.

The Government Program of Industrial Control and Economic Recovery

Provides $400,000,000 for Roads of $3,300,000,000 Total Appropriation

TO encourage national industrial recovery, to foster fair competition, to provide for the construction of certain useful public works. . . ."

In these words are explained the purposes of the bill known as S. 1712 or, more popularly, the National Industrial Recovery Act.

The most cursory reading of the bill, the full text of which is presented herewith, will disclose the novel nature of its provisions, but close study is necessary for a realization of the extent to which the principles and privileges of individual industrial conduct are to be taken over by the federal government in the interest of the public good. Some of the most important features of this side (Title I) of the bill will be enumerated in what follows and where the language of the bill itself is not sufficiently clear, the interpretations and views of officials and others familiar with the administration's intentions and objectives will be offered as comment. As these comments reflect the views of many different men, they can not be credited to them individually.

Control of Industry.—The principal objective of Title I of the bill is the supervision, regulation and control of private industry and trade for a maximum period of two years, or for a shorter period, should the "emergency," which is cited as the reason for the legislation, cease to exist (Sec. 2c). Despite this specific limitation it is generally believed that the law would become permanent in its operation.

On the question of the purposes of the bill Bernard M. Baruch had the following to say in a recent address: "The primary purpose of this act is to bring about and maintain industrial stability through, among other things: (1) Reëmployment of labor, (2) the maintenance or increase of wages, (3) standardization of the hours of labor, (4) the control of production, and (5) the establishment of a fair price scale." As the bill reflects to a large extent Mr. Baruch's ideas, his views are important.

In the words of Senator Wagner who introduced the bill, a single purpose underlies it, "to bring about a widespread increase in employment, (1) through coöperative action by industry itself, and (2) through the inauguration of a vast construction program by the government."

S. 1712

A BILL

To encourage national industrial recovery, to foster fair competition, and to provide for the construction of certain useful public works, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled.

TITLE I—INDUSTRIAL RECOVERY

Declaration of Policy

Sec. 1. A national emergency productive of widespread unemployment and disorganization of industry, which burdens interstate commerce, affects the public welfare, and undermines the standards of living of the American people, is hereby declared to exist. It is hereby declared to be the policy of Congress to remove obstructions to the free flow of interstate commerce which tend to diminish the amount thereof; and to promote the organization of industry for the purpose of coöperative action among trade groups, to induce and maintain united action of labor and management under adequate governmental sanctions and supervision, to eliminate unfair competitive practices, to reduce and relieve unemployment, to improve standards of labor, and otherwise to rehabilitate industry and to conserve natural resources.

Administrative Agencies

Sec. 2. (a) To effectuate the policy of this title, the President is hereby authorized to establish such agencies, to accept and utilize such voluntary and uncompensated services, to appoint, without regard to the provisions of the civil service laws, such officers and employees, and to utilize such federal officers and employees, and, with the consent of the state, such state and local officers and employees, as he may find necessary, to prescribe their authorities, duties, responsibilities, and tenure, and, without regard to the Classification Act of 1923, as amended, to fix the compensation of any officers and employees so appointed.

(b) The President may delegate any of his functions and powers under this title to such officers, agents, and employees as he may designate or appoint, and may establish an industrial planning and research agency to aid in carrying out his functions under this title.

(c) This title shall cease to be in effect and any agencies established hereunder shall cease to exist at the expiration of two years after the date of enactment of this act, or sooner if the President shall by proclamation declare that the emergency recognized by section 1 has ended.

Codes of Fair Competition

Sec. 3. (a) Upon the application to the President by one or more trade or industrial associations or groups, the President may approve a code or codes of fair competition for the trade or industry or subdivision thereof, represented by the applicant or applicants, if the President finds: (1) that such associations or groups impose no inequitable restrictions on admission to membership therein and are truly representative of such trades or industries or subdivisions thereof, and (2) that such code or codes are not designed to promote monopolies or to eliminate or oppress small enterprises and will not operate to discriminate against them, and will tend to effectuate the policy of this title. The President may, as a condition of his approval of any such code, impose such conditions (including requirements for the making of reports and the keeping of accounts) for the protection of consumers, competitors, employees, and others, and in furtherance of the public interest, and may provide such exceptions to and exemptions from the provisions of such code, as the President in his discretion deems necessary to effectuate the policy herein declared.

(b) After the President shall have approved any such code, the provisions of such code shall be the standards of fair competition for such trade or industry or subdivision thereof. Any violation of such standards in any transaction in or affecting interstate commerce shall be deemed an unfair method of competition in commerce within the meaning of the Federal Trade Commission Act, as amended. A violation of any provision of any such code shall be a misdemeanor and upon conviction thereof an offender shall be fined not more than $500 for each offense. (*Continued on next page.*)

Although business will retain the ownership and management of its properties and although its initiative will not be destroyed, such ownership, management and initiative will be exercised for the first time in the interest of the public rather than in that of the owners of business. In determining what constitutes public interest the government will proceed largely on the theory that business of all kinds exists for the benefit of the public and, so, is public business.

The Place of Trade Associations.—This supervision will be carried out in part through trade associations, to which will be given authority to accomplish many things, such as price regulation, allocation and limitation of production, etc., which are now illegal. While producers who do not belong to their trades' associations will not be compelled to join, since the bill does not give the government that power, their position can be made not only uncomfortable but unprofitable through the ability of the associations to distribute production and to do other things with government sanction. Not all trade associations will receive government approval, but only those which are "truly representative" of the industries (Sec. 3a1, Sec. 6b). This will probably be interpreted to mean that these bodies must represent more than half their industries, considered with respect both to the numbers of producers in those industries and to the total production in those industries.

By giving such trade associations the right to formulate codes of fair practices, subject to presidential approval, the government will make them in effect law-enforcement instrumentalities with the power to punish or coerce recalcitrant minorities (Sec. 3a), and the power of the federal courts can be brought to bear on offenders (Sec. 3c). And, if these trade associations refuse or neglect to formulate such codes of "fair competition," the President may, "upon his own motion, or if complaint is made . . . that abuses inimical to the public interest . . . are prevalent," prescribe a code to be observed (Sec. 3d).

Presidential Approval and Licensing.—All "voluntary" agreements "between and among persons engaged in a trade or industry, labor organizations, and trade or industrial organizations, associations, or groups," will be subject to approval by the President and the giving of this approval will be depend-

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(c) The several district courts of the United States are hereby invested with jurisdiction to prevent and restrain violations of any code of fair competition approved under this title; and it shall be the duty of the several district attorneys of the United States, in their respective districts, under the direction of the Attorney General, to institute proceedings in equity to prevent and restrain such violations.

(d) Upon his own motion, or if complaint is made to the President that abuses inimical to the public interest and contrary to the policy herein declared are prevalent in any trade or industry or subdivision thereof, and if no code of fair competition therefor has theretofore been approved by the President, the President, after such public notice and hearing as he shall specify, may prescribe and approve a code of fair competition for such trade or industry or subdivision thereof, which shall have the same effect as a code of fair competition approved by the President under subsection (a) of this section.

Agreements and Licenses

Sec. 4. (a) The President is authorized to enter into agreements with, and to approve voluntary agreements between and among, persons engaged in a trade or industry, labor organizations, and trade or industrial organizations, associations, or groups, relating to any trade or industry, if in his judgment such agreements will aid in effectuating the policy of this title with respect to transactions in or affecting interstate commerce, and will be consistent with the requirements of clause (2) of subsection (a) of Sec. 3 for a code of fair competition.

(b) Whenever the President, after such public notice and hearing as he shall specify, shall find it essential to license business enterprises in order to make effective a code of fair competition or an agreement under this title or otherwise to effectuate the policy of this title, and shall publicly so announce, no person shall, after a date fixed in such announcement, engage in or carry on any business, in or affecting interstate commerce, specified in such announcement, unless he shall have first obtained a license issued pursuant to such regulations as the President shall prescribe. The President may suspend or revoke any such license, after due notice and opportunity for hearing, for violations of the terms or conditions thereof. Any order of the President suspending or revoking any such license shall be final if in accordance with law. Any person who, without such a license or in violation of any condition thereof, carries on any such business for which a license is so required, shall, upon conviction thereof, be fined not more than $500, or imprisoned not more than six months, or both, and each day such violation continues shall be deemed a separate offense.

Sec. 5. While this title is in effect and for 60 days thereafter, any code, agreement, or license approved, prescribed, or issued and in effect under this title, and any action complying with the provisions thereof taken during such period, shall be exempt from the provisions of the anti-trust laws of the United States.

Limitations Upon Application of Title

Sec. 6. (a) No trade or industrial association or group shall be eligible to receive the benefit of the provisions of this title until it files with the President a statement containing such information relating to the activities of the association or group as the President shall by regulation prescribe.

(b) The President is authorized to prescribe rules and regulations designed to insure that any organization availing itself of the benefits of this title shall be truly representative of the trade or industry or subdivision thereof represented by such organization. Any organization violating any such rule or regulation shall cease to be entitled to the benefits of this title.

(c) Upon the request of the President the Federal Trade Commission shall make such investigations as may be necessary to enable the President to carry out the provisions of this title, and for such purposes the commission shall have all the powers vested in it with respect of investigations under the Federal Trade Commission Act, as amended.

Sec. 7. (a) Every code of fair competition, agreement, and license approved, prescribed, or issued under this title shall contain the following conditions: (1) That employees shall have the right to organize and bargain collectively through representatives of their own choosing, (2) that no employee and no one seeking employment shall be required as a condition of employment to join any organization or to refrain from joining a labor organization of his own choosing, and (3) that employers shall comply with the maximum hours of labor, minimum rates of pay, and other working conditions, approved or prescribed by the President.

(b) The President shall, so far as practicable, afford every opportunity to employers and employees in any trade or industry or subdivision thereof with respect to which the conditions referred to in clauses (1) and (2) of subsection (a) prevail, to establish by mutual agreement, the standards as to the maximum hours of labor, minimum rates of pay, and such other working conditions as may be necessary in such trade or industry or subdivision thereof to effectuate the policy of this title; and the standards established in such agreements, when approved by the President, shall have the same effect as a code of fair competition, approved by the President under subsection (a) of Sec. 3.

(c) Where no such mutual agreement has been approved by the President he may investigate the labor practices, policies, wages, hours of labor, and working conditions in such trade or industry or subdivision thereof; and upon the basis of such investigations, and after such hearings as the President finds advisable, he is authorized to prescribe a limited code of fair competition fixing such maximum hours of labor, minimum rates of pay, and other working conditions in the trade or industry or subdivision thereof investigated as he finds to be necessary to effectuate the policy of this title, which shall have the same effect as a code of fair competition approved by the President under subsection (a) of Sec. 3. The President may differentiate according to experience and skill of the employees affected and according to the locality of employment; but no attempt shall be made to introduce any classification according to the nature of the work in-

ent on whether or not such agreements are consistent with the intent of Sec. 3a2 of the bill (Sec. 4a). All agreements which receive such approval "shall be exempt from the provisions of the anti-trust laws" during the life of the act and for two months thereafter (Sec. 5).

By the system of licensing provided some administration supporters expect to control individual enterprises, even though there is some doubt of the constitutionality of such a method. The licensing power provided by the bill is exercisable within the discretion of the President (Sec. 4b).

Hours, Wages, Prices.—The agreements which fall within the scope of these provisions can, in the opinion of officials, be made not only to fix the hours and wages of labor, but also to prevent selling below the cost of production, the intent of the administration being to raise prices. Labor agreements may set maximum hours and minimum wages, and may establish better working conditions.

The bill safeguards the rights of workers to bargain collectively (Sec. 7a1), while it maintains open-shop conditions (Sec. 7a2), and enforces upon employers the duty of complying with the hours, wages and working conditions "approved or prescribed by the President" (Sec. 7a3). All industries will be given, "so far as practicable," the opportunity of making their own agreements on these points (Sec. 7b), but if such voluntary agreements are not made, the President may investigate conditions and prescribe remedies (Sec. 7c).

The Public-Works Program.—Title II of the bill provides for the creation of a Federal Emergency Administration of Public Works to be directed by a Federal Emergency Administrator of Public Works (Sec. 201) who will have charge of the expenditure of the $3,300,000,000 appropriated by the bill (Sec. 209) for expenditure during a period of two years.

The works to be undertaken, as enumerated in Sec. 202, are:

"(a) Construction, repair, and improvement of public highways and parkways, public buildings, and any publicly-owned instrumentalities and facilities." For "public highways and related projects" the bill gives the President authority to make

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volved which might tend to set a maximum as well as a minimum wage.

(d) As used in this title, the term "person" includes any individual, partnership, association, trust, or corporation.

Application of Agricultural Adjustment Act

Sec. 8. This title shall not be construed to repeal or modify any of the provisions of the act entitled "An act to relieve the existing national economic emergency by increasing agricultural purchasing power, to raise revenue for extraordinary expenses incurred by reason of such emergency, to provide emergency relief with respect to agricultural indebtedness, to provide for the orderly liquidation of joint-stock land banks, and for other purposes," approved May 12, 1933.

Rules and Regulations

Sec. 9. (a) The President is authorized to prescribe such rules and regulations as may be necessary to carry out the purposes of this title, and fees for licenses and for filing codes of fair competition, and any violation of any such rule or regulation shall be punishable by fine of not to exceed $500 or imprisonment for not to exceed six months, or both.

(b) The President may from time to time cancel or modify any order, approval, license, rule, or regulation issued under this title; and each agreement, code of fair competition, or license approved, prescribed, or issued under this title shall contain an express provision to that effect.

TITLE II—PUBLIC WORKS AND CONSTRUCTION PROJECTS

Federal Emergency Administration of Public Works

Sec. 201. (a) To effectuate the purposes of this title the President is hereby authorized to create a Federal Emergency Administration of Public Works (hereafter referred to as the "Administration"), all the powers of which shall be exercised by a Federal Emergency Administrator of Public Works (hereafter referred to as the "Administrator"), and to establish such agencies, to accept and utilize such voluntary and uncompensated services, to appoint, without regard to the civil service laws, such officers and employees, and to utilize such federal officers and employees, and, with the consent of the state, such state and local officers and employees as he may find necessary, to prescribe their authorities, duties, responsibilities, and tenure, and, without regard to the Classification Act of 1923, as amended, to fix the compensation of any officers and employees so appointed. The President may delegate any of his functions and powers under this title to such officers, agents, and employees as he may designate or appoint.

(b) The Administrator may, without regard to the civil service laws or the Classification Act of 1923, as amended, appoint and fix the compensation of such experts and such other officers and employees as are necessary to carry out the provisions of this title; and may make such expenditures (including expenditures for personal services and rent at the seat of government and elsewhere, for law books and books of reference, and for paper, printing and binding) as are necessary to carry out the provisions of this title.

(c) All such compensation, expenses, and allowances shall be paid out of funds made available by this act.

(d) After the expiration of two years after the date of the enactment of this act, or sooner if the President shall, by proclamation, declare that the emergency recognized by Sec. 1 has ended, the President shall not make any further loans or grants or enter upon any new construction under this title, and any agencies established hereunder shall cease to exist and any of their remaining functions shall be transferred to such departments of the Government as the President shall designate: *Provided,* That he may issue funds to a borrower under this title prior to Jan. 23, 1939, under the terms of any agreement entered into with such borrower prior to the date of termination, under this section, of the power of the President to make loans.

Sec. 202. The Administration, under the direction of the President, shall prepare a comprehensive program of public works, which shall include among other things the following: (a) Construction, repair, and improvement of public highways and park ways, public buildings, and any publicly owned instrumentalities and facilities; (b) conservation and development of natural resources, including control, utilization, and purification of waters, prevention of soil erosion, development of water power, transmission of electrical energy, and construction of river and harbor improvements; (c) any projects of the character heretofore constructed or carried on either directly by public authority or with public aid to serve the interests of the general public; (d) construction under public regulation or control of low-cost housing and slum-clearance projects; (e) any project (other than those included in the foregoing classes) of a character heretofore eligible for loans under subsection (a) of Sec. 201 of the Emergency Relief and Construction Act of 1932, as amended; and if in the opinion of the President it seems desirable the construction of naval vessels within the terms and/or limits established by the London Naval Treaty of 1930 and of airplanes required therefor and construction of such army housing projects as the President may approve, and provision of original equipment for the mechanization or motorization of such Army tactical units as he may designate: *Provided however,* That in the event of an international agreement for the further limitation of armament, to which the United States is signatory, the President is hereby authorized and empowered to suspend, in whole or in part, any such naval construction or mechanization and motorization of army units.

Sec. 203. (a) With a view to increasing quickly employment (while reasonably securing any loans made by the United States) the President is authorized and empowered, through the Administration or through such other agencies as he may designate or create, (1) to construct, finance, or aid in the construction or financing of any public-works project included in the program prepared pursuant to Sec. 202; (2) upon such

grants to the states "not to exceed $400,000,000 in aggregate amount" (Sec. 204a).

"(b) Conservation and development of natural resources, including control, utilization, and purification of waters, prevention of soil erosion, development of water power, transmission of electrical energy, and construction of river and harbor improvements."

"(c) Any projects of the character heretofore constructed or carried on either directly by public authority or with public aid to serve the interests of the general public."

"(d) Construction under public regulation or control of low-cost housing and slum-clearance projects."

"(e) Any project (other than those included in the foregoing classes) of a character heretofore eligible for loans under subsection (a) of Sec. 201 of the Emergency Relief and Construction Act of 1932 as amended."

(f) The construction of naval vessels, airplanes, army housing projects, and the "mechanization or motorization" of army tactical units. The exercise of this provision is within the President's discretion.

Any of these works may be constructed or financed by the government "with a view to increasing quickly employment" (Sec. 203a1).

The government may also make grants to states, municipalities or other public bodies "for the construction, repair, or improvement of any such project" not to exceed 30 per cent. of the cost of the labor and materials used on it (Sec. 203a2.).

Aid may also be given by financing railroad maintenance and equipment approved by the Interstate Commerce Commission.

Road-Building.—As already mentioned, the extent of the government's participation in road-building projects is limited to $400,000,000 (Sec. 204a). No other form of project carries a specified maximum. This is held to favor road-building, as it is practically certain that the full amount named will be spent for that type of work, whereas other forms of construction may suffer individually from political tampering. This money is to be spent for:

(1) Emergency construction of the "federal-aid

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terms as the President shall prescribe, to make grants to states, municipalities, or other public bodies for the construction, repair, or improvement of any such project, but no such grant shall be in excess of 30 per centum of the cost of the labor and materials employed upon such project; (3) to acquire by purchase, or by exercise of the power of eminent domain, any real or personal property in connection with the construction of any such project, and to sell any security acquired or any property so constructed or acquired or to lease any such property with or without the privilege of purchase: *Provided*, That all moneys received from any such sale or lease or the repayment of any loan shall be used to retire obligations issued pursuant to Sec. 207 of this act, in addition to any other moneys required to be used for such purpose; and (4) to aid in the financing of such railroad maintenance and equipment as may be approved by the Interstate Commerce Commission as desirable for the improvement of transportation facilities: *Provided*, That in deciding to extend any aid or grant hereunder to any state, county, or municipality the President may consider whether action is in process or in good faith assured therein reasonably designed to bring the ordinary current expenditures thereof within the prudently estimated revenues thereof. The provisions of this section shall extend to public works in the several states, Hawaii, Alaska, the District of Columbia, Puerto Rico, and the Virgin Islands.

(b) All expenditures for authorized travel by officers and employees, including subsistence required on account of any federal public-works projects, shall be charged to the amounts allocated to such projects notwithstanding any other provisions of law; and there is authorized to be employed such personal services in the District of Columbia and elsewhere as may be required to be engaged upon such work and to be in addition to employees otherwise provided for, the compensation of such additional personal services to be a charge against the funds made available for such construction work.

(c) In the acquisition of any land or site for the purposes of federal public buildings and in the construction of such buildings provided for in this title, the provisions contained in Sec. 305 and 306 of the Emergency Relief and Construction Act of 1932, as amended, shall apply.

Sec. 204. (a) For the purpose of providing for emergency construction of public highways and related projects, the President is authorized to make grants to the several states (not to exceed $400,000,000 in agregate amount) as follows:

(1) For expenditure in emergency construction on the Federal-aid highway system and extensions thereof into and through municipalities. The amount apportioned to any state under this paragraph may be used to pay all or any part of the cost of highway construction including the elimination of hazards to highway traffic, such as the separation of grades at crossing, the reconstruction of existing railroad grade crossing structures, the relocation of highways to eliminate railroad crossings, the widening of narrow bridges and roadways, the building of footpaths, the replacement of unsafe bridges, the construction of routes to avoid congested areas, the construction of facilities to improve accessibility and the free flow of traffic, and the cost of any other construction that will provide safer traffic facilities or definitely eliminate existing hazards to pedestrian or vehicular traffic. In carrying out the improvements to eliminate traffic hazards in connection with railroad crossings at grade, the state highway department shall constitute an agency of the federal government. No funds made available by this title shall be used for the acquisition of any land, right of way, or easement in connection with any railroad grade elimination project.

(2) For expenditure in emergency construction on secondary or feeder roads to be agreed upon by the state highway departments and the Secretary of Agriculture: *Provided*, That the state or responsible political subdivision shall provide for the proper maintenance of said roads. Such grants shall be available for payment of the full cost of surveys, plans, improvement, and construction of secondary or feeder roads, on which projects shall be submitted by the state highway department and approved by the Secretary of Agriculture.

(b) Any amounts allocated by the President for grants under subsection (a) of this section shall be apportioned among the several States, three-fourths in accordance with the provisions of Sec. 21 of the Federal Highway Act, approved Nov. 9, 1921, as amended and supplemented, and one-fourth in the ratio which the population of each state bears to the total population of the United States, according to the latest decennial census, and shall be available on July 1, 1933, and shall remain available until expended; but no part of the funds apportioned to any state need be matched by the state.

(c) All contracts involving the expenditure of such grants shall contain provisions establishing minimum rates of wages, to be predetermined by the state highway department, which contractors shall pay to skilled and unskilled labor, and such minimum rates shall be stated in the invitation for bids and shall be included in proposals for bids for the work.

(d) In the expenditure of such amounts, the limitations in the Federal Highway Act, approved Nov. 9, 1921, as amended and supplemented, upon highway construction, reconstruction, and bridges within municipalities and upon payments per mile which may be made from federal funds, shall not apply.

(e) As used in this section the term "state" includes the Territory of Hawaii. The term "highway" as defined in the Federal Highway Act, approved Nov. 9, 1921, as amended and supplemented, for the purposes of this section, shall be deemed to include such main parkways as may be designated by the state and approved by the Secretary of Agriculture as part of the federal-aid highway system.

Sec. 205. All contracts let for construction projects and all loans and grants pursuant to this title shall contain such provisions as are necessary to insure: (1) that no convict labor shall be directly employed on any such project; (2) that (except in executive, administrative, and supervisory positions), so far as practicable, no individual directly employed on any such project shall be permitted to work more than thirty hours in any one week; (3) that all employees shall be paid just and reasonable wages which shall be compensation sufficient to provide, for the hours of labor as limited, a standard of living in decency and com-

COMPARISON OF THE TOTAL CONSTRUCTION BUSINESS OF THE UNITED STATES IN 1929 AND THE FEDERAL PUBLIC-WORKS PROGRAM OF 1933
(See the foot-note.)

Type of Construction	PART I—ALL CONSTRUCTION WORK—1929							
	Total Cost				Cost of Aggregates			
	Divisional Costs		Subdivisional Costs		Divisional Costs		Subdivisional Costs	
	(A) Amount	% of Total	(B) Amount	% of A	Amount	% of A	Amount	% of B
Roads and Streets	$ 725,892,207	16.2			$ 95,858,150	13.2		
Highways			$ 350,399,990	48.2			$56,597,963	16.1
Bridges and culverts			115,123,526	15.8			5,163,358	4.5
Grading			25,225,457	3.6			1,297,497	5.1
Street paving			235,143,234	32.4			32,799,332	13.9
Public Work (other than roads and streets)	188,313,351	4.2			8,521,659	4.5		
Sewer, gas, water, conduit			88,620,606	47.1			5,165,592	5.8
Dam and reservoir			17,045,565	9.0			783,950	4.6
Waterworks			23,272,535	12.3			990,359	4.3
Dredging rivers, harbors, etc			59,374,645	13.6			1,581,758	2.6
Building	1,803,326,210	40.1			38,103,403	2.1		
Commercial			92,427,164	5.1			1,847,765	2.0
Manufacturing			32,947,452	1.8			615,613	1.8
Residential			153,695,687	8.5			1,670,506	1.0
Other building			1,524,255,907	84.6			33,969,519	2.2
Miscellaneous	270,623,220	6.3			7,523,867	2.8		
Railroad			60,133,126	22.2			2,582,000	4.3
Central station			128,417,899	47.5			2,218,936	1.7
Others			82,072,195	30.3			2,722,931	3.3
Subcontractors	1,494,292,744	33.2			14,316,868	1.0		
Concreting			56,265,745	3.8			6,866,472	12.2
Masonry			65,131,047	4.4			2,336,696	3.6
Plastering and lathing			64,247,526	4.3			1,411,616	2.2
Others			1,308,648,426	87.5			3,702,084	.2
Totals or averages	$4,482,447,732	100.0			$164,323,947	3.7		

[1] Sums appropriated by the National Industrial Recovery Act. The other money sums in Column C have been calculated on the proportions shown by the 1929 record. All the other money amounts in Section II of the table have been derived in the same manner.

highway system and extensions thereof into and through municipalities." This may include related highway work, such as grade crossings, relocation, bridge-building, etc. (Sec. 204a1). The money granted to the states for these purposes will be apportioned as follows: three-fourths as provided by Sec. 21 of the Federal Highway Act (Nov. 9, 1921) as amended and supplemented, and one-fourth *pro rata* according to the population of the individual states. The states need not match the government grants (Sec. 204b), and the limitations of the highway act respecting work within municipalities and payments per mile will not apply (Sec. 204d).

(2) Emergency construction on secondary or feeder roads, which must be maintained by the local political subdivision (Sec. 204a2).

All the work done with federal money must be performed at minimum rates of wages, which must be fixed by the state highway department and stated in the invitations for bids (Sec. 204c). No convict labor will be employed, no one directly employed on government projects will be allowed to

fort; and (4) that in the employment of labor in connection with any such project, preference shall be given, where they are qualified, to ex-service men with dependents.

Rules and Regulations

Sec. 206. The President is authorized to prescribe such rules and regulations as may be necessary to carry out the purposes of this title, and any violation of any such rule or regulation shall be punishable by fine of not to exceed $500 or imprisonment not to exceed six months, or both.

Issue of Securities and Sinking Fund

Sec. 207. (a) The Secretary of the Treasury is authorized to borrow, from time to time, under authority of the Second Liberty Bond Act, as amended, such amounts as may be necessary to meet the expenditures authorized by this act, or to refund any obligations previously issued under this section, and to issue therefor bonds, notes, certificates of indebtedness, or Treasury bills of the United States authorized by such act, as amended, in the manner and under the terms and conditions therein prescribed.

(b) For each fiscal year beginning with the fiscal year 1934 there is hereby appropriated, in addition to and as part of, the cumulative sinking fund provided by Sec. 6 of the Victory Liberty Loan Act, as amended, out of any money in the Treasury not otherwise appropriated, for the purpose of such fund, an amount equal to 2½ per centum of the aggregate amount of the expenditures made out of appropriations made or authorized under this act as determined by the Secretary of Treasury.

Reemployment and Relief Tax

(Taxation provisions to be inserted later as Sec. 208.)

Appropriation

Sec. 209. For the purposes of this act there is hereby authorized to be appropriated, out of any money in the Treasury not otherwise appropriated, the sum of $3,300,000,000.

TITLE III—AMENDMENTS TO EMERGENCY RELIEF AND CONSTRUCTION ACT AND MISCELLANEOUS PROVISIONS

Sec. 301. After the expiration of 10 days after the date upon which the Administrator has qualified and taken office: (1) no application shall be approved by the Reconstruction Finance Corp. under the provisions of subsection (a) of Sec. 201 of the Emergency Relief and Construction Act of 1932, as amended, and (2) the Administrator shall have access to all applications, files, and records of the Reconstruction Finance Corp. relating to loans and contracts and the administration of funds under such subsection: *Provided*, That the Reconstruction Finance Corp. may issue funds to a borrower under such subsection (a) prior to Jan. 23, 1939, under the terms of any agreement entered into with such borrower pursuant to an application approved prior to the date of termination, under this section, of the power of the Reconstruction Finance Corp. to approve applications.

Decrease of Borrowing Power of Reconstruction Finance Corporation

Sec. 302. The amount of notes, debentures, bonds, or other such obligations which the Reconstruction Finance Corp. is authorized and empowered under Sec. 9 of the Reconstruction Finance Corp. Act, as amended, to have outstanding at any one time is decreased by $000,000,000.

Separability Clause

Sec. 303. If any provision of this act, or the application thereof to any person or circumstances, is held invalid, the remainder of the act, and the application of such provision to other persons or circumstances, shall not be affected hereby.

Short Title

Sec. 304. This act may be cited as the "National Industrial Recovery Act."

COMPARISON OF THE TOTAL CONSTRUCTION BUSINESS OF THE UNITED STATES IN 1929 AND THE FEDERAL PUBLIC-WORKS PROGRAM OF 1933 (continued)
(See the foot-note.)

Type of Construction	Part II—Public-Works Program—1933							
	Total Cost				Cost of Aggregates			
	Divisional Costs		Subdivisional Costs		Divisional Costs		Subdivisional Costs	
	(C) Amount	% of Total	(D) Amount	% of C	Amount	% of C	Amount	% of D
Roads and Streets	$ 400,000,000[1]	12.1			$52,800,000	13.2		
Highways			$192,800,000	48.2			$31,163,900	16.1
Bridges and culverts			63,200,000	15.8			2,851,500	4.5
Grading			14,400,000	3.6			745,100	5.1
Street paving			129,600,000	32.4			18,039,500	13.9
Public Work (other than roads and streets)	150,000,000	4.5			6,750,000	4.5		
Sewer, gas, water, conduit			70,650,000	47.1			4,111,700	5.8
Dam and reservoir			13,500,000	9.0			623,200	4.6
Waterworks			18,450,000	12.3			777,300	4.3
Dredging rivers, harbors, etc.			47,400,000	31.6			1,237,800	2.6
Building	1,400,000,000	42.5			29,400,000	2.1		
Commercial			71,400,000	5.1			1,415,000	2.0
Manufacturing			25,200,000	1.8			453,000	1.8
Residential			119,000,000	8.5			1,185,000	1.0
Other building			1,184,400,000	84.6			26 347,000	2.2
Miscellaneous	220,000,000	6.7			6,160,000	2.8		
Railroad			48,840,000	22.2			2,153,000	4.3
Central station			104,500,000	47.5			1,849,000	1.7
Others			66,660,000	30.3			2,158,000	3.3
Subcontractors	1,130,000,000	34.2			11.300,000	1.0		
Concreting			42,940,000	3.8			5,460,000	12.2
Masonry			49,720,000	4.4			1,850,000	3.6
Plastering and lathing			48,590,000	4.3			1,100,000	2.2
Others			988,750,000	87.5			2,890,000	.2
Totals or averages	$3,300,000,000[1]	100.0			$106,410,000	3.3		

[1] Sums appropriated by the National Industrial Recovery Act. The other money sums in Column C have been calculated on the proportions shown by the 1929 record. All the other money amounts in Section II of the table have been derived in the same manner.

work more than 30 hr. in any one week, all employees will be paid enough to provide a "standard of living in decency and comfort," and preference will be given to ex-service men with dependents when qualified (Sec. 205).

The Appropriation.—The Treasury is authorized to borrow the money needed to finance the government in this work under the authority of the Second Liberty Bond Act, as amended, and to issue securities therefor (Sec. 207). The bill appropriates the sum of $3,300,000,000 for the purposes set out (Sec. 209).

The Cost of Aggregates.—The accompanying table presents a comparison between the construction industry in 1929 (top of page 20) with the public-works program of the National Industrial Recovery Act (above). The figures in Part I of the table (page 20) show under "Total Cost" the amounts spent in 1929 for all kinds of construction —public and private—together with a breakdown by subdivisions. Under the "Cost of Aggregates" are given the amounts spent for aggregate materials in all classes of construction with percentages. The data in Part II of the table contain two actual figures —$400,000,000 appropriated for roads and $3,300-000,000 appropriated for the entire public-works program. The other figures are calculated from these, using the percentages derived in Part I of the table on the assumption that the $2,900,000,000 appropriated for purposes other than roads may be distributed among various types of construction as the construction business was in 1929. Then the potential demand for aggregates in each class has been derived from these figures, using the percentages which obtained in 1929.

The result shows more than $100,000,000 as the cost of the aggregates needed for the completion of the government's program, or over 3 per cent. of the total appropriation. The average is held down by the low aggregate requirements of some kinds of construction work.

Sixteen per cent. of the money spent for highways goes for aggregates, making $31,163,900; practically 14 per cent. of street-paving costs goes for aggregates, making $18,039,500; and 2 per cent. of "other-building" costs goes into aggregates, or $26,347,000.

Of the $400,000,000 appropriated for highways in the bill, $52,800,000 will probably be spent for aggregates. This is more than one-fourth of the value of the country's entire crushed-stone and sand-and-gravel output in the peak year of 1929. Other public works, such as sewers, gas, dam, reservoir and water works and dredging rivers and harbors will require about $6,750,000 worth of aggregates; building will take $29,400,000 worth, subcontractors' work $11,300,000 worth, and miscellaneous works $6,160,000. As the powers created by the bill are broad, some types of construction (such as "commercial," "residential," etc.) which would not ordinarily be thought of as public works, have been included.

1933 Construction Lower

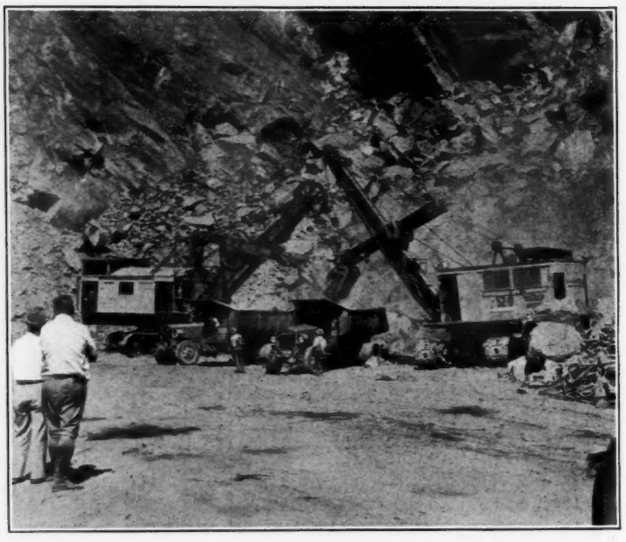
New construction in the United States during the first quarter of 1933 amounted to about $250,000,-000, as against a little more than $300,000,000 in the corresponding period of 1932, according to a survey made recently by the Indiana Limestone Co.

Motor Trucks Withstand the Severe Tests of Dam Construction

THE use of motor trucks on the San Gabriel Dam No. 2 project located in the San Gabriel Canyon some 30 mi. from the city of Los Angeles is of interest to producers because the conditions under which they operate are even more severe than those found in quarries. This dam is one of two being constructed by the Los Angeles County Flood Control District, and is of unique construction because it is being built entirely of rock-fill with concrete slab facing. The fill requires approximately 1,200,000 cu.ft. of metamorphic rock, ranging from quarry chips to single pieces weighing over 25 tons, all which must be hauled entirely by motor trucks. The McCutchen Transportation Co., Los Angeles, accepted the job and, from all reports, is making rapid progress.

The operation is attracting the attention of engineers and contractors throughout the nation since it is the first rock-filled dam of this size to be constructed where rock is transported from the quarry to the dam in place. The quarry is located 2 mi. upstream from the dam site, and, owing to the narrow canyon, it was necessary to open a road out of the side of the canyon between the quarry and the dam site. The road in itself holds the key to the successful operation on this kind of work. It was built 30 ft. in width and was surfaced with waste from the quarry. The stone is being continuously sprinkled with water and makes an ideal road-bed. The trucks operating over it give it the smoothness of a boulevard. At the dam site ramps, with a short grade to reach each 25-ft. lift as the fill progresses, have been provided.

The specifications on the project call for a minimum of 2,000 filled cu.yd. per day. Rock is loaded in the quarry by two large Bucyrus-Erie shovels. As compared to ordinary construction jobs, this project offers a much more difficult problem because the rock is blasted to allow as many large pieces as possible. Naturally, the larger the rock, the greater the danger of damaging truck and shovel equipment. When rocks weighing 20 tons or more are loaded, smaller pieces are loaded first to form a cushion for the larger ones. The truck loads average 60,000 lb. gross.



Shovels loading "armor-plated" trucks in the quarry.

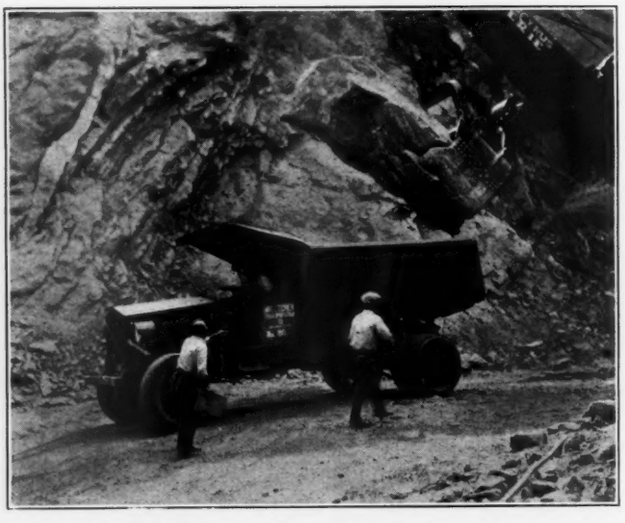
The ten trucks being used are Sterlings which possess some unique features in design. They are chain-driven, powered with large Waukesha 6-cylinder engines. The rear axles, instead of being of the conventional I-design, are made of 6-in. heat-treated steel shafting. The frames are 9-in. double channels, lined with solid oak planks. All cross-members and other units are bolted to the wood inlay so there is no metal-to-metal contact. The front tires are 24-in. by 10/50-in. pneumatics, while the rear tires are 40-in. by 14-in. solid duals.

The stripped chassis weighs 15,500 lb. The body and hoist were made by Wood. The former is of heavy steel plate, fabricated with H-beams. The floors are laminated with ½-in. plate at the bottom and a 2-in. wood filler. The dumping time is 10 sec., which is exceedingly fast considering the weight of the body and its load.

The engine, headlights and cab are covered with heavy armor plate as a protection against heavy stones, which may fall in the hauling operations.

A great many estimates were made prior to the beginning of the project as what the swell would be in the fill cu.yd. over a bank cu.yd. So far, the swell has been 60 to 80 per cent., making a truck cu.yd. almost equivalent to a fill cu.yd. in place. The haul is 2 mi. and the trucks average 25 min. per round trip.

Owing to the fact that most of the rock being hauled is in 1-cu.ft. pieces and larger, it was a serious problem to work out a roadway on the fill smooth enough to eliminate cutting and excessive wear of the tires. This was accomplished by using large rope mats, made of 3-in. hawser rope, which were placed at the immediate dumping point, thus allowing the trucks to back over them. These mats are 10 ft. by 4 ft. and weigh approximately 200 lb. They are shifted each time the trucks are required to dump in a different location.



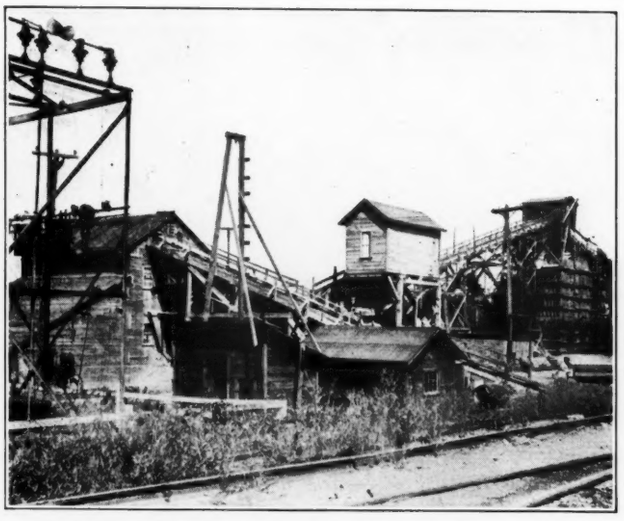
Shovel handling large piece of stone to one of the trucks.

Pioneer Gravel Operator Finds Complete Repair-Parts Stock Essential

Preparedness Almost Eliminates Loss of Plant Operating Time

PLANT designers and operators usually devote much thought and money to building and maintaining modern and efficient plants, but it is comparatively seldom that much attention is paid to the problem of reducing the amount of time lost due to break-downs. An exception is the Ideal Sand & Gravel Co., Mason City, Ia. Grant McGowan, president of this company, is a great believer in preparedness and carries a complete stock of all kinds of repair and replacement parts. As a result, the plant has never been forced to shut down more than 2 hr. at any time due to a breakdown.

There is nothing unusual in any other way about the company's operations. The plant, which is located at the northeast city limits, originally went into operation in 1916 with a capacity of 100 tons per hr. Additions and improvements made since that time have increased its capacity to about 300 tons per hr. The property consists of 700 acres of gravel, of which about 400 acres have been worked out. The material runs about 50 per cent. gravel, of which 30 per cent. is over 2 in. in size and is crushed. Most of the product is used for highways.



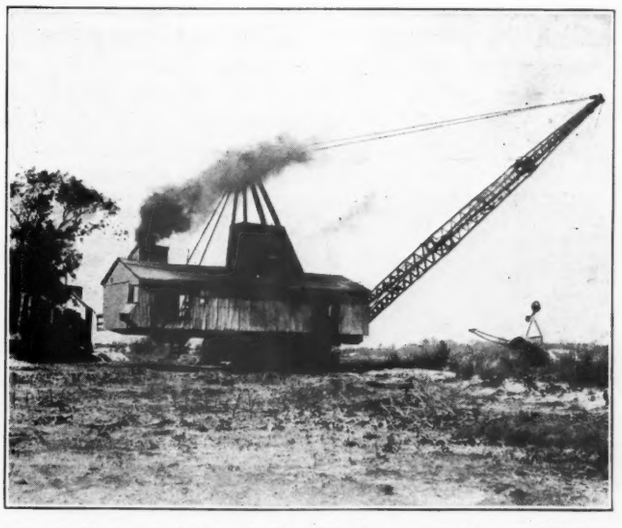
General view of plant with track hopper in right foreground.

Gravel is loaded by two Monighan steam drag-lines mounted on skids and rollers and handling 2-cu.yd. and 2½-cu.yd. Page drag-line buckets. Each of these operates in a separate section of the deposit and is served on a separate track. The material recovered by each drag-line is removed by a 40-ton steam locomotive hauling a train of 50-ton cars to the plant, a distance of about 2,000 ft. at present. While waiting for the train to return the drag-lines overcast the overburden, which is 2 to 3 ft. deep.

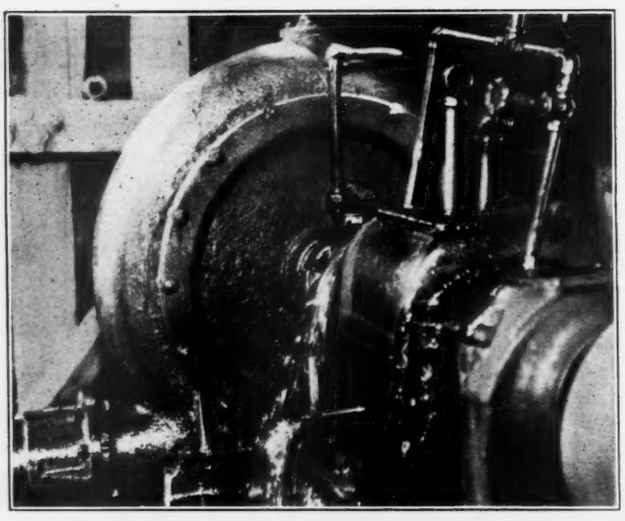
The cars discharge their contents into a steel-lined track-hopper at the plant. A Link-Belt apron feeder carries the material to a 30-in. inclined belt-conveyor which operates on 100-ft. centers and takes it to the scalping-and-crushing building. The Link-Belt 4-ft. by 14-ft. scalping screen in this building has 3-in. and 2-in. openings. The material over 3 in. in size goes to an Austin No. 6 gyratory crusher, while that retained on the 2-in. section goes to an Austin No. 4 gyratory crusher. Both machines crush to 2-in. minus and discharge their products on a 24-in. belt-conveyor set on 60-ft. centers. This discharges the material to a third conveyor which feeds back to the scalping screen.

The material under 2 in. in size which comes from the scalping screen goes to a 24-in. inclined belt-conveyor which operates on 230-ft. centers and discharges through a split chute to two pairs of Link-Belt conical screens. The first screen of each pair has 2-in. and the second has 1-in. perforations, producing No. 7 and No. 6 stone respectively. The 1-in. minus material goes to a cylindrical screen having ¼-in. openings. The oversize material from this screen goes to two 4-ft. by 5-ft. Hum-mer double-deck vibrating screens which produce No. 5 stone on their top and No. 4 on their bottom decks.

The fine material from the vibrators goes to a hopper from which a sand-drag discharges its product to bins. The sand from the cylindrical screen goes to two pairs of Link-Belt sand-cones which discharge their products to the same bins. The overflow from these cones goes through a flume to a



One of the steam skid-and-roller drag-lines removing overburden.



The 8-in. dredge pump used to rehandle waste material to pit.

box from which it is rehandled by an 8-in. Diamond dredge-pump back into the waste-pit which is now too far from the plant to be reached by gravity flow. When the amount of sand is in excess of the requirements, either or both series of cones can be shut down and the sand wasted.

The steel-braced timber bins supporting the screening structure have five compartments with a capacity of 500 tons each. Trucks are loaded on one side and cars on the other. Most of the product is used for highway work. Truck shipments are weighed on a 20-ton Howe truck-scale at the plant office. The company owns an International 1½-ton truck and a Relay 2½-ton truck for local deliveries.

An Ohio locomotive crane handling a 1¼-cu.yd. Hayward clamshell bucket is used for stock-piling or rehandling materials. Every autumn stock-piles are built up to about 25,000 tons for winter shipments. Each of three Goulds centrifugal pumps furnishes 1,000 gal. per min. of wash-water from a reservoir which was formerly an old slough bed. Most of the equipment in the plant was furnished by the Link-Belt Co. Cincinnati Rubber Co. conveyor belting and Leschen cable are used.

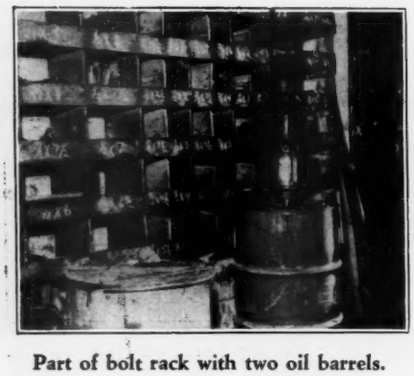
In line with its policy of preparedness the company has a complete machine- and repair-shop in which 98 per cent. of all repairs can be made. Among the equipment are a wheel-puller and press, hack saw, lathes, emery wheel and radial drill-press, all belt-driven from one motor. There is also a pit for working under cars and locomotives, acetylene and electric welding sets, a forge, a trip-hammer, and miscellaneous tools.

The storage building is in the same building as the plant office. In it are racks for all sizes and kind of bolts, nuts, screws, nails, etc., as well as chains, sheaves, pulleys, shafting, tool steel, rope, cable, hand shovels, etc. There are also motor oil, grease, paint, drill bits, grease cups, conveyor idlers, belts, conveyor belting, tools of all descriptions, brake shoes, springs, bushings, electric-light bulbs, blocks, pipe fittings, waste, rivets, etc.

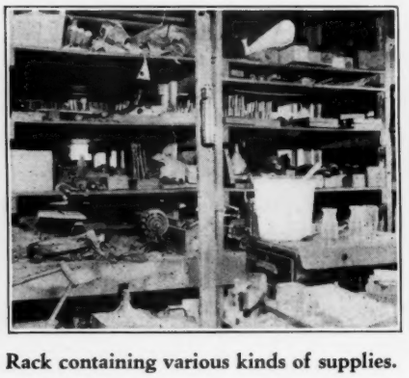
The bolts, screws, rivets, etc., have separate racks, so no time is lost in finding any desired size of type. There is also a separate rack for each major unit, such as the drag-lines, locomotives, locomotive crane, and for each part of the plant, where small parts for it can readily be found. There are also two Ajax chemical fire engines on wheels. The second floor of the building is used for the storage of gears, sprockets, etc. There are also a number of spare 10- 35- and 50-hp. electric motors which can be used in case of a motor failure.

The two gyratory reduction crushers.

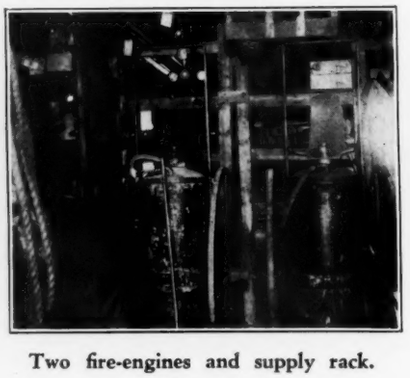
The office alongside the storeroom is another example of the thoroughness with which everything at this plant is done. In addition to a complete set of office equipment there is a radio and several fans for the office workers' comfort and entertainment. There is also a large fireproof vault for the safe storage of records. A 4-stall concrete-block garage is provided for the employees' cars.



Part of bolt rack with two oil barrels.



Rack containing various kinds of supplies.



Two fire-engines and supply rack.

Major Economies in Burning Cement Clinker in the Rotary Kiln

By A. W. CATLIN
Manitowoc Engineering Works

PREVAILING conditions in the cement industry have brought forcibly to the attention of operators the very great desirability of introducing operating economies in many existing plants if they are to survive, and since the item of fuel bulks large on the production cost sheet, it is perhaps in order to investigate the possibilities offered in further reducing fuel consumption. It is not suggested that the industry has been delinquent in this respect, or is disposed to rest on the laurels of past achievement, but of late a great deal of thought and effort have been directed to this particular problem, resulting in the development of new ideas as well as new equipment for putting these ideas into practice. A recent contribution to PIT AND QUARRY reviews this subject[1] and the statement of the author that we may expect fuel rates on wet-process kilns of less than 60 lb. of coal per bbl. must, in the light of recent improvement, be considered conservative. In dry-process plants fuel rates much below this figure are already accomplished facts.

Heat Loses in Rotary Kiln.—A most cursory examination of the burning process as conducted in the rotary cement kiln discloses three major sources of heat loss, which—not necessarily in the order of their importance—are represented by: (1) the heat carried away in the exit flue gases, (2) the loss due to radiation and convection from the kiln shell, and (3) the heat contained in the clinker being discharged. While all these at various times have received attention at the hands of engineers and operators, and tangible savings have been effected, particularly in heat recovery from exit gases, the possibilities have by no means been exhausted. It is logical to conclude, therefore, that further progress will inevitably result if we approach the problem from the viewpoint of dealing with these losses at their sources. The introduction and the elaboration of minor refinements in cement burning will naturally contribute to this end, but any outstanding economies must necessarily be expected to result from a full consideration of these major factors.

It is perhaps unnecessary to point out that the thermal efficiency of the kiln is at best quite low, so low in fact that in plants considered as modern, particularly from the standpoint of kiln design, it is not unusual to find the kilns consuming as much as 100 lb. of coal per bbl. of cement produced, or, in other words, requiring in the neighborhood of 1,300,000 B.t.u. to bring the raw-material equivalent of a barrel of cement to clinkering temperature. In the older plants employing short kilns this figure may run as high as 2,000,000 B.t.u. per bbl.

Various figures are quoted giving the theoretical heat requirement for burning in the kiln, a recent statement placing this at 412,000 B.t.u. per bbl. This figure is necessarily an approximation when applied generally, but, accepting it at its face value and granting that it is largely of academic interest only, nevertheless it serves as a basis for comparison and presents a mark for the ambitious to shoot at.

Recovering Heat from Clinker.—As just stated, considerable progress has been made in extracting heat from exit flue gases, but for many years no serious attention had been paid to the question of heat recovery from the high-temperature clinker being discharged from the kiln. Recently, however, this problem has come to the fore and an added impetus has been given to the movement because the rotary cooler is no longer adequate to deal with the heavy tonnage production of large, modern kilns. This is particularly true where outputs, already high, have been increased by the advent of the slurry filter. The filter not only increased outputs but it also reduced fuel consumption materially with a corresponding reduction in the air available for cooling purposes. The rotary cooler as usually installed has not much to offer in the way of heat recovery, for its cooling function depends largely upon heat dissipation through the shell to the surrounding air. Furthermore, it furnishes at the most only a portion of the secondary air required for combustion in the kiln, much of this secondary air being induced through cold-air leakage at the firing-hood, and the net result is a limited amount of preheat in the total air volume. The cooling problem has been attacked, therefore, not alone with a view to more efficient cooling, but at the same time with the incentive to conserve a greater portion of the heat content of the clinker than was possible in the rotary cooler.

Viewed in this perspective, the problem naturally resolves itself into two separate and distinct operations, namely, a preliminary cooling stage in which the initial high temperature of the clinker is made available for preheating the secondary air employed for combustion of the fuel in the kiln, followed by a secondary or after-cooling stage calculated to reduce the clinker to normal grinding temperature. In this last stage if further air be employed, such air is not admitted to the kiln, but is discharged to the atmosphere at a relatively low temperature. Dual-purpose coolers intended to accomplish these results have been designed and placed in operation. Since they not only provide a certain amount of preheat, but also effect the final cooling as well, obviously they are intended to replace rotary coolers.

Application of the Recuperator.—In line with this development, the Vanderwerp recuperator has been introduced to the industry primarily as a fuel-saver and not particularly as a clinker cooler in the sense

[1] *Possibilities of Greater Fuel Economy in Wet-Process Cement Burning* by A. W. Robinson. PIT AND QUARRY, April, 1933, p. 20-22, 40.

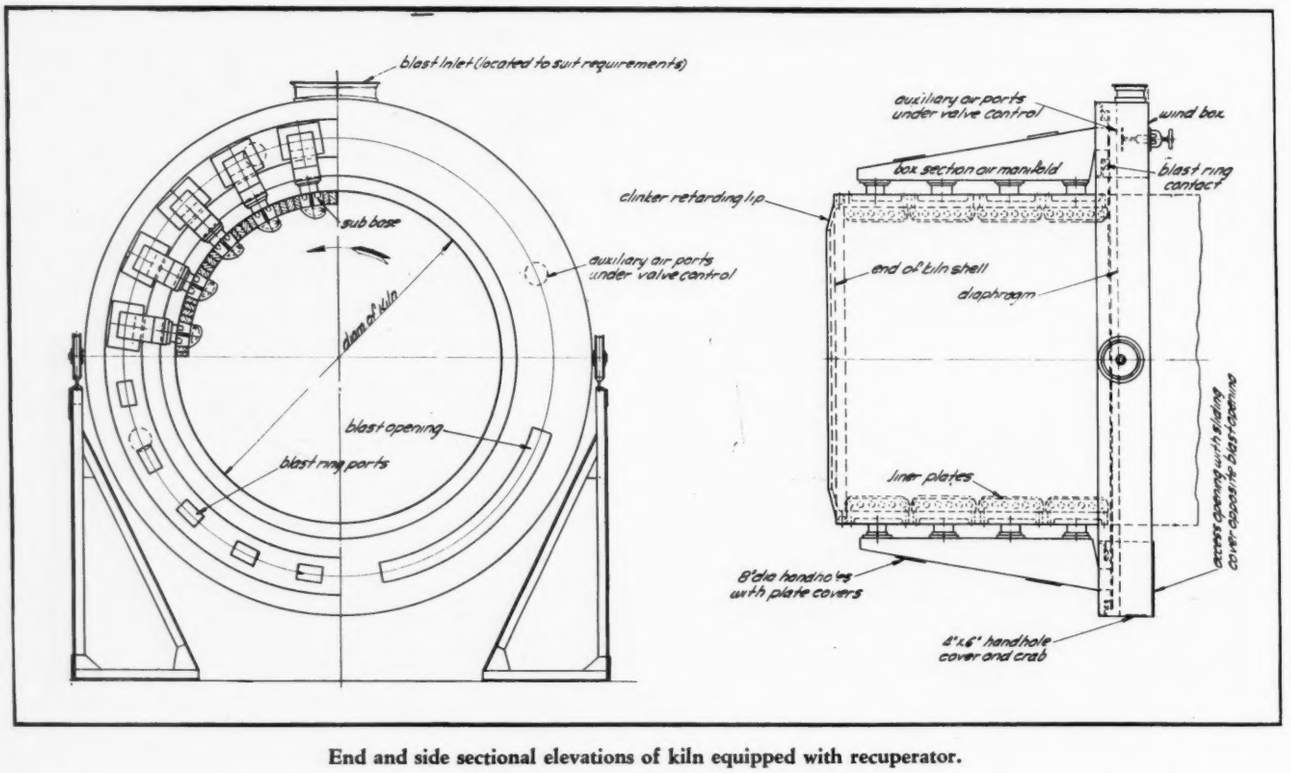
of cooling down to grinding requirements, which it makes no pretense of doing. This device, originally incorporated as an integral part of the rotary cooler, has more recently been built into the kiln in order to take full advantage of its high efficiency as an air preheater. Installed in this manner, it makes possible the attainment of high preheat in the *total* secondary air volume, extracting heat from the clinker and transferring it to the air supply. Coincident with this heat transfer, the clinker is naturally greatly reduced in temperature, allowing the rotaries or other cooling devices to deal successfully with the final cooling, relieving such cooling equipment of the destructive effects due to overheating which results in high maintenance costs. This method of treatment also obviates the use of the objectionable water-spray, both on the coolers and the accessory equipment, such as conveyors, hot drags and elevators.

In this application the existing cooler, is of course, not discarded nor is it restricted in its function of cooling by limited air supply. However, its cooling ability would be adversely affected if the cooler uptake were to enter the kiln and the total permissible air volume were to be still further reduced by the amount of primary air used, plus leakage. Employed in conjunction with the recuperator, the cooler would be provided with an entirely independent supply of cooling air in sufficient quantity to meet all cooling requirements, this air not entering the kiln but being by-passed to the atmosphere. The actual location of the cooler is unimportant. For example, if each of the kilns has its own independent cooler, such equipment would not be disturbed. Or, on the other hand, one large rotary cooler might conveniently serve several kilns being placed at any desired location, for instance, at the end of the clinker-conveyor system ahead of storage.

The introduction of all secondary air into the kiln through the recuperator lining plates under pressure effectually excludes the entrance of extraneous air due to the slight pressure maintained in the cooling-zone, which also serves to prevent cold-air infiltration, doing away with the seal-ring at this point. As a consequence, the total secondary air volume employed for combustion purposes is preheated to a degree not possible in any other application of heat recovery. Heat loss through radiation is practically nil, as the heat exchange is effected within the kiln. The method of air admission employed, which is in the nature of a forced draft, greatly reduces the draft requirements at the backhousing and has the effect also of steadying the draft in the kiln, which otherwise frequently fluctuates between wide limits. The very considerable reduction in fuel consumption as the result of preheat and increased flame potential naturally lessens the volume and velocity of the exit gases, so much, in fact, that the dust loss from the raw feed is greatly reduced. This also has a most important effect upon the output of the waste-heat boiler following the kiln. Not only has the total evaporation been increased, but the evaporation per pound of fuel burned in the kiln has been increased to a much greater extent.

The application of a recuperator to a cement kiln has already been described in these columns[2] and at the time certain operating data were presented. A brief summary of conditions and results obtained is again offered together with later information now available.

[2] PIT AND QUARRY, June 1, 1932, p. 31-34.



End and side sectional elevations of kiln equipped with recuperator.

Results of Operation.—The plant in question operates on the dry process, returning a considerable quantity of treater dust from the Cottrell precipitators to the kiln. Pulverized coal, having a heat value of approximately 12,300 B.t.u. (as fired), is employed as fuel in a kiln about 10 ft. by 8½ ft. in diameter and 150 ft. long, equipped with a waste-heat boiler, an economizer, and induced draft. The recuperator was provided with a total of 80 liner plates—each having three air-blowing orifices—in four series occupying a total length of 8 ft. in the discharge end of the kiln, there being 20 plates to each series extending around the full circle of the kiln shell. An unprotected blast-pipe 8 in. in inside diameter, extending 8 ft. into the kiln, was at first employed. This was later replaced by a water-jacketed pipe of the same diameter but 2 ft. shorter. The following figures summarize the general results obtained.

Normal capacity of kiln	60 bbl. per hr.
Capacity with recuperator (average of two tests)	60.7 bbl. per hr.
Air supply to kiln: (at time of first weighed clinker test):	
Primary (at 80 deg. F.)	1,935 cu.ft. per min. 18 per cent.
Secondary (at 80 deg. F.)	8,795 cu.ft. per min. 82 per cent.
Total (at 80 deg. F.)	10,730 cu.ft. per min. 100 per cent.
Total theoretical (at 80 deg. F.)	9,625 cu.ft. per min.
Excess (at 80 deg. F.)	1,105 cu.ft. per min. 11 per cent.
Air pressure in recuperator wind-box:	
Maximum employed	12 in. water gage
Minimum employed	5 in. water gage
Draft in back housing (average)	0.04 in. water gage
Preheat in secondary air:	
Average	1,100 to 1,300 deg. F.
Maximum recorded	1,494 deg. F.
Preheat in primary air (80 deg. F. initial)	None
Temperature of clinker on plates	2,400 deg. F.
Temperature of clinker off plates (average)	1,000 to 1,200 deg. F.
Fuel saving as compared to best performance of adjacent kilns to date	16⅔ per cent.
Fuel saving conceded with improved draft regulation at back housing in comparison with best performance to date	20 per cent.

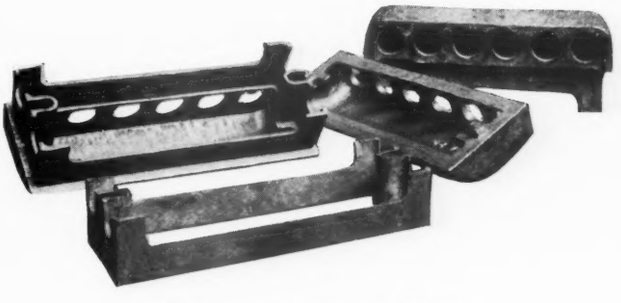
Considering the results thus far obtained in practice, it is perhaps advisable to mention that the figures quoted were obtained in ordinary, commercial production without any attempt on the part of the regular operating staff to establish a favorable record. As a matter of fact, the recuperator has not had the advantage of certain instrumental controls which have shown promise in connection with other kilns in the same plant. Reference is made particularly to automatic pyrometer control of the coal feed, maintaining a predetermined temperature in the burning zone, or in a section of the kiln adjacent thereto. Such control doubtless would be of great value, if generally adopted, and especially so in a kiln operating under conditions of high air preheat and high flame temperature.

Qualities of the Product.—The clinker from the "recuperated" kiln is hard-burned and vitreous. It shows a lower free-lime content than the normal clinker, indicating the possibility of carrying a higher lime ratio in the raw mix. The 24-hr. breaks are on the average 20 lb. higher than those ordinarily obtained. It is an open question whether or not the 3-day, 7-day and 28-day breaks will in the long run average higher than the usual breaks, which are well above standard specifications.

In this connection it may be said that during the last test run of the kiln, when upwards of 17,000 bbl. was produced, the raw mix at certain periods was unbalanced to such an extent that strengths were correspondingly lowered. Even so, the quality of the cement produced on this run averaged well up to the high standard maintained generally in the plant. It was believed from the results of tests made during the earlier stages of the operation that strengths would be improved throughout the entire range and there is still justification for the belief when all factors are taken into consideration.

Air-Quenching and Grindability.—It was also expected that marked improvement in grindability would result from air-quenching the clinker, as grinding tests in this plant and elsewhere tended to establish this fact. However, full-scale grinding as against laboratory reduction in a small pulverizing mill did not bear out this claim. Those who still have faith in the virtues of air-quenching may find some consolation in the fact that the air-quenched clinker fresh from the kiln was ground alongside well-seasoned clinker from storage. The air-cooled product also was remarkably free from dust, which characteristic would naturally involve a greater amount of work in the grinding units.

Dust Reduction.—The almost complete absence of dust is, of course, a valuable feature in other respects as it greatly reduces the dust loss encountered in all plants and in this one in particular, where the clinker is discharged from elevators into open storage. This characteristic is also of advantage in after-cooling with cooling air by-passed to the atmosphere as previously mentioned. The dustless nature of the clinker coming from the recuperator has not been observed, or at least has not been reported, as an operating result from other types of air-pressure coolers external to the kiln. It explains at once the high visibility in the kiln immediately it has attained normal operating temperature.



The improved recuperator plates.

Combustion.—The nature of the secondary-air admission through the recuperator plates is such as to create relatively high turbulence at the point where ignition takes place. It is axiomatic that high turbulence promotes rapid combustion and that stratification of the air-fuel mixture retards it, particularly when accompanied by excess air, or dilution. We know also that preheat in a kiln attenuates the flame through rarefaction of the gaseous components of the fuel mixture. The effect, therefore, of early ignition because of turbulence—aided by preheat—is to compensate flame length so that the combustion zone is not unduly prolonged. In the kiln under discussion the burning zone is un-

doubtedly longer than in the normal kiln, at any rate, clinkering occurs earlier, but if exit gas temperatures are a measure of thermal efficiency, nothing is lost thereby.

Economical operation has been obtained with the recuperator when the exit gases carried as little as 5 per cent. excess air with traces of CO. It seems, therefore, that it is quite unnecessary to employ such inordinate air volumes as are indicated as desirable in general practice.[3] In all probability a slight excess can be used to advantage simply to insure that combustion is complete.

Other Fuel-Saving Devices.—While it is not the purpose of this discussion to enter into a detailed description of the many well-proved fuel-saving devices already adopted, mention can be made of two comparatively recent contributions, namely, the slurry drier and the Lepol kiln. The drier, it would appear from reliable information, is of particular value in wet-process plants where filters and waste-heat boilers are not employed, as it is claimed to be capable of reducing the residual moisture of cement slurries to from 3 to 8 per cent., the exit flue-gases furnishing the necessary heat for evaporative purposes.

The Lepol kiln constitutes a notable advance in cement-burning technique and has established a most favorable record for economy. Although it has not as yet appeared in this country, there are 18 widely-scattered installations in Europe, South America and Japan employing a wide variety of raw materials, including limestone-slag mixtures. Contrary to what might be expected, the "slag" plant has not shown quite as low fuel consumption as is obtained at Bari, Italy, where natural raw materials are burned, with a reported heat expenditure in the kiln of 550,000 B.t.u. per bbl. of cement produced. This excellent result, however, is not altogether surprising to those who are familiar with the Bari raw-material deposits.

From a heat-recovery standpoint the Lepol kiln is equivalent to the waste-heat boiler plus the economizer, results probably favoring the Lepol system, since the exit-gas temperatures are lower than in waste-heat-boiler practice, but the operation of the Lepol kiln has the distinct advantage of using the fuel solely for the purpose of making cement with no division of production into cement making and power making.

Since the Lepol system employs a cooler of the rotary type following the kiln, the logical procedure to adopt, if we are seeking the ultimate in *initial* fuel economy, accompanied by thorough cooling of the clinker, is the installation of a recuperator at the discharge end of the Lepol kiln, this installation, of course, requiring no alterations of existing equipment or plant lay-out. Such a combination would result in reducing the coal consumption in the kiln to a point well below anything yet achieved by any combination of fuel-having devices. The operation of the recuperator in conjunction with the waste-heat boiler, with the waste-heat return credited to coal consumption, confirms this statement, as will be readily apparent when figures are released.

Recent Recuperator Improvements.—As previously mentioned, the original recuperator has already been described in this journal, but since that time improvements in certain details have been incorporated. It will be recalled that the recuperator comprises an annular wind-box which surrounds the kiln near its discharge end and supplies an air-blast, created by a fan, through manifolds to the metal liner plates inside the kiln shell, these discharging the air under pressure through suitable *tuyere* openings. The main air-blast is directed immediately under the bed of hot clinker as it approaches the kiln discharge, thereby effecting a heat exchange between the exit clinker and the incoming air within the kiln itself.

Basically, the recuperator design has not been altered, but remains substantially as originally installed, the principal changes having to do with the liner plates and resulting from experience gained in operation. The original plates in the 10-ft. kiln covered the entire area of the cooling zone for a length of 8 ft. longitudinally and extended around the full inner surface of the shell, 80 plates being employed, with 1½ in. of insulation between the plates and the shell. In the later design the same number of plates was used but these are "spotted" on approximately 17-in. spacing around the circle with a clear space of about 8 in. between the plates, these intervals being occupied by brickwork 4½ in. in thickness. This newer type of plate is carried upon a comparatively light-section alloy-steel subframe, surrounding the admission-air nipple, and grouted on the interior up to the level of the brickwork. There is, consequently, a solid lining throughout the cooling zone, 4½ in. thick, with the exception of the circular air-duct openings and the through bolts securing the plates to the shell.

The design is such as to allow the use of standard shapes for the brick portion of the lining, employing an equal number of No. 1 arch and 9-in. straight fire brick, for a total of 880 bricks in the 10-ft. kiln.

In the original article describing the recuperator it was stated that the plates in service remained black. Generally speaking, this was correct, but on occasion, particularly with the secondary-air supply temporarily reduced considerably in volume, it was observed that the first, or hot, row of No. 20 Pyrasteel attained a cherry to light-red color, indicating a plate temperature of approximately 1,500 deg. F. This was well within the safe working temperature of the Pyrasteel, but was not so desirable should this temperature extend to the remaining plates of

(*Continued on page 32*)

[3] We were told recently that in order to obtain the most efficient kiln operation, from the thermal aspect, regardless of the relative proportions of primary and secondary air, from 15 to 20 per cent. of excess air is needed. Expressed in another way, we must burn considerable additional fuel in the kiln to heat excess air to exit-gas temperature in an endeavor to *save* fuel. This paradoxical situation occasions no surprise when the primitive nature of the customary fuel-burning system is considered. Truly, "primitive" is not an unjust description of accepted methods employed to obtain an air-fuel mixture in the combustion zone. Here the primary injection of fuel and air is augmented by the secondary-air supply, consisting largely of cold-air leakage around the kiln shell at the firing-hood. Wire-drawing through the kiln, this great bulk of secondary air is expected to associate itself intimately with the fuel and promote combustion. A portion of it undoubtedly does so, despite our precautions to the contrary, but the 15 to 20 per cent. mentioned in all probability does not even make contact with the fuel.

Gravel Producer of Long Standing Adds Stone Plant to Operations

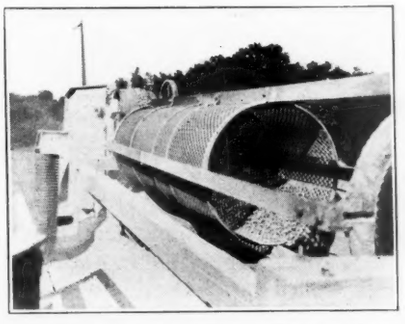
Hauls Stone from Quarry to Plant With Crawler-Mounted Dump Tractors

THE firm of Larimer & Shaffer, Inc., Cedar Rapids, Ia., which has been a sand-and-gravel producer for the past 27 years, entered into the production of crushed stone about a year ago with a new plant. This plant is located on Cedar River, 3 mi. northeast of down-town Cedar Rapids. It is of timber construction throughout with concrete plant and crusher footings and has a capacity of 100 tons per hr.

The deposit of limestone is a thick ledge sloping upward and away from the plant ground-level. The overburden at present consists of about 20 ft. of clay and 15 ft. of low-grade limestone not suitable for aggregate. Below this is the seam of good limestone of unknown depth. As the quarry is enlarged, the overburden will decrease and finally disappear almost entirely, leaving a face of good rock at least 50 ft. in height above the present quarry level.

The clay overburden is removed during slack seasons and the waste stone is shot down separately while good stone is being taken out of another part of the quarry. Illinois Gold Medal explosives are used for blasting. An Armstrong well-drill and Gardner-Denver jackhammers bring the stone down to plant size. The stone is loaded by a Thew Lorain 75A gasoline crawler shovel which loads two 10-ton Koehring Dumptors. These haul a distance of about 300 ft. to the plant. According to R. D. Larimer, general superintendent of the company, the Dumptors are ideal for the conditions, which include a comparatively short haul over rough terrain and a fairly stiff grade leading to the crusher.

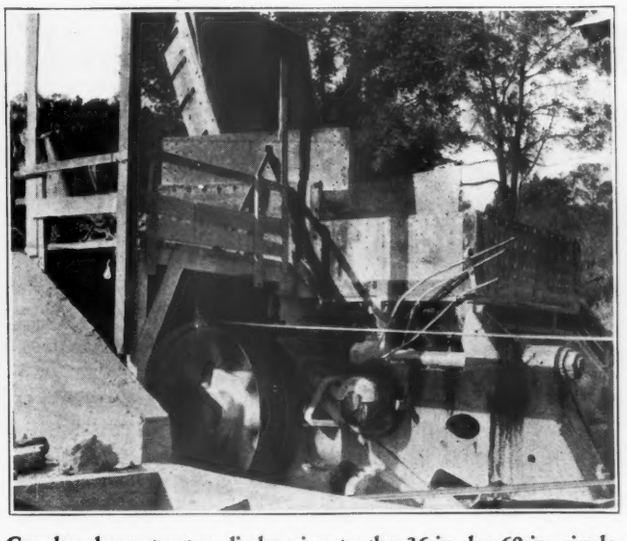
The Dumptors discharge directly to the Allis-Chalmers Fairmount 36-in. by 60-in. primary crusher, which is belt-driven by a 200-hp. electric motor. An eccentric feeder supplies a 30-in. belt-conveyor which discharges to a 20-in. belt-conveyor feeding the scalping and secondary crushing building. This conveyor discharges to a 40-in. by 16-ft. revolving scalping screen having $1\frac{5}{16}$- and $1\frac{3}{8}$-in. perforations on two of its three sections. The large oversize material goes to a No. $7\frac{1}{2}$ Austin gyratory crusher and the fine oversize to a 30-in. by 16-ft. belt-conveyor and thence to a No. $5\frac{1}{2}$ Austin gyratory crusher. Both crushers discharge on a 24-in. return belt-conveyor feeding a 24-in. belt bucket-elevator. This feeds back to the scalping screen through a chute.



The revolving sizing screen which makes the first separation of the finished product.

The two smaller sizes of material coming from the screen are fed to a short cross conveyor which discharges them on the main conveyor leading to the top of the screening building. This belt is 18 in. wide and operates on 152-ft. centers. The 40-in. by 18-ft. revolving sizing screen has $\frac{3}{4}$-in. square, $\frac{3}{4}$-in. round, and

Gasoline shovel loading crawler dump tractor in quarry. The well-drill is shown at right.



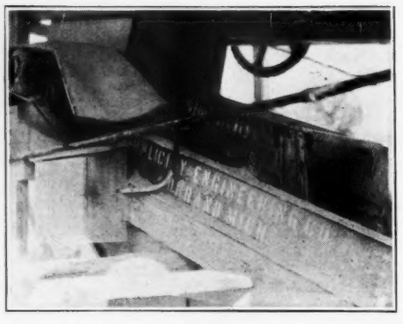
Crawler dump tractor discharging to the 36-in. by 60-in. single-roll primary crusher.

The screening-and-storage building with tunnel reclaiming conveyor for loading cars and trucks at left.

The crushing-and-scalping building viewed from the top of the screening-and-storage building.

1¼-in. round openings. The two large sizes of material go direct to storage and the fines to a short belt-conveyor feeding a 2-ft. by 6-ft. Simplicity single-deck vibrating screen with 3/16-in openings. The two sizes produced by this screen also go direct to storage.

The storage-bins are of timber braced with steel and have four compartments with a total capacity of 300 tons. The bins discharge through sliding gates on an 18-in. horizontal belt-conveyor operating on 90-ft. centers in a concrete tunnel under them. This conveyor feeds an 18-in. inclined loading belt which discharges direct to cars on a siding for shipment.



The 2-ft. by 6-ft. single-deck vibrating screen which makes the two smallest finished sizes.

The bulk of the material sold is used as road stone. This size, which passes specifications of 100 per cent. through a 1¼-in. round opening and not more than 10 per cent. through No. 8 screen, is mixed on the tunnel conveyor. Considerable material 3/16-in. to ¾-in. and ¾-in. to 1-in. size is used for concrete aggregate. Some of this is used in the company's Cedar Rapids ready-mixed-concrete plant which also went into operation about a year ago. As yet very little market has been developed for material under 3/16 in. in size and most of this is wasted.

Practically all the equipment in the plant is belt- or chain-driven. The two reduction crushers, the bucket-elevator and the second conveyor leading to the scalping screen are driven from one 150-hp. motor. The two cross conveyors are individually driven by 3-hp. motors, the scalping screen by a 20-hp. motor, and the main conveyor by a 15-hp. motor. The first conveyor is driven by a 20-hp. motor and drives the feeder by chain from its tail-pulley. The tunnel conveyor is chain-driven from the tail-pulley of the loading conveyor which is driven by a 20-hp. motor at its head end.

The machine-shop is equipped to make minor repairs only. It houses a Gardner-Denver forge and an Ingersoll-Rand drill-sharpener. A Gardner-Denver compressor, driven by a 75-hp. General Electric motor, furnishes the air for secondary drilling. Manhattan "International" conveyor belting is used throughout.

In addition to this plant the company operates a ready-mixed-concrete plant and a sand-and-gravel plant. The former uses four truck-mixers, of which two are on General Motors chassis.

The main office of Larimer & Shaffer, Inc., is at the concrete plant at 1007 First St., N. W., Cedar Rapids, Ia. The company's officers are: R. I. Larimer, president; G. A. Shaffer, vice-president; R. V. Roupe, secretary and treasurer; R. D. Larimer, general superintendent.

Magnesite Industry in 1932

According to the United States Bureau of Mines, the total quantity of crude magnesite mined in the United States in 1932 was 38,462 short tons, with an approximate value of $283,304, according to reports furnished by producers. This represents a decrease of 47.7 per cent. from the quantity mined in 1931 (73,602 short tons).

Sales of magnesite of domestic origin in 1932 were 575 short tons of crude, valued at $5,474, a decrease of 56.6 per cent. in quantity and 63 per cent. in value from 1931; 3,374 short tons of caustic calcined, valued at $103,196, a decrease of 42.8 per cent. in quantity and 43 per cent. in value, compared with 1931; and 14,836 short tons of dead-burned, valued at $308,327, a decrease of 47.4 per cent. in quantity and 43.4 per cent. in value, compared with 1931.

Concrete Masonry Units as an Outlet for Producers' Waste Materials

Changes in Design Have Opened the Way for Small Sizes of Aggregates

WHILE the mortality of concrete-products plants has been great during the past three years it has resulted in one noticeable beneficial effect on the industry as a whole. That effect is the development of more aggressiveness in the sales field and a tendency toward a higher, better type of construction in which concrete masonry units have been used.

While it is commonly said that this field is already overcrowded, it is believed that it will never be too crowded for firms using modern merchandising and aggressive sales methods. There is always room for the plant that: (1) makes a quality product, (2) manufactures it economically, (3) merchandises it aggressively. These three fundamentals may be said to be the basic principles on which any manufacturer must conduct his business if he is to be successful.

While a large number of aggregate producers have never manufactured concrete products, those who have, and who have based their operating methods on the three fundamentals mentioned above, have met with no small measure of success. The problem with them has been one of utilizing what otherwise would be a waste material or a material that was glutting their stock-piles, namely, an excess of fine aggregate. A recommended practice for the manufacture of concrete masonry units is that aggregates should be no larger than half the web thickness of the unit that is being manufactured. With the decrease in web thickness so prevalent in the industry at the present time, the size of aggregate in use has been gradually scaled down so that at present few plants use aggregate greater than ¼ in. in diameter. This, in many cases, will fall into the category of excess material now in the stock-piles of many crushed-stone and sand-and-gravel producers.

Little need be said about the manufacture of the units themselves. Fundamentally, thinner-web thicknesses call for higher-grade concrete than thick, and most communities to-day rigidly enforce building-code regulations that tend toward a better grade of unit than was put on the market in many communities in the past. The average producer who is familiar with good concrete and the manufacture of good concrete units merely needs to apply this knowledge to secure maximum manufacturing efficiency and units that will meet all building-code standards and specifications.

A year ago the Concrete Masonry Assn. was instrumental in the publication of a sales manual, *Facts About Concrete Masonry,* which has given the industry more standing and prestige than any other piece of material which has come from it. This manual is a compilation of all the experimental work conducted by both the association itself, the Portland Cement Assn. and other allied interests over a period of some ten years. Every statement in the manual is backed by authoritative data secured in reliable testing laboratories.

It takes up fire resistance, comparative wall strengths of concrete masonry and clay tile and clay brick. It gives the strength of composite walls constructed of concrete masonry and face brick. It tells the effect of mortar bedding and mortar strength on concrete-masonry walls. It gives information about building watertight walls, calculating loads, and also some information on concrete ashlar walls. Crushed-stone and sand-and-gravel producers interested in the production of concrete masonry and the utilization of their excesses of fine material should by all means secure a copy of the manual and study it carefully.

The last-mentioned subject, that of concrete ashlar walls, demands special attention. This is a development which requires little or not great investment for new equipment and machinery, but it seems to have greater possibilities for exposed construction than any other recent development in the concrete-masonry field. It is *the* modern development in this branch of the cement industry.

Random ashlar construction is so called when several sizes of units are laid up random. Coursed ashlar units are arranged according to height to form regular courses in the face of the wall. It is called patterned random when the units are laid up apparently at random but actually according to a definite pattern which is repeated again and again in the face of the wall. Concrete ashlar offers many possibilities for architectural treatment.

Color can be introduced by the use of selected aggregates in the face or by mineral pigments applied to the concrete at the time the units are molded. Also, the units can be stained or colored with Portland-cement paint as they are taken from the machine, or the finished walls can be suitably colored after erection.

Practically any texture from smooth to rough can be produced by the proper securing and grading of aggregates when the mixture is designed. No one is more capable of doing this than the aggregate producer, and if he will carefully grade his aggregates to secure the textures he desires he can produce unusually effective results.

Concrete ashlar has opened a market not only for exterior walls but for interior as well. A wide variety of finishes may be applied to interior walls as well as exterior, and paint may be used in one color, two colors, or in several blending colors. A

pleasing two-tone effect is produced by painting the entire surface of an open-textured unit with Portland-cement paint and then brushing the high spots with a thick soupy paint of a different color, usually a lighter tint. For interior work, where it is desired to preserve the beauty and natural acoustical properties of the open-textured concrete ashlar, the paint is applied in such a manner that it coats the entire surface without filling the tiny depressions which serve to absorb sound.

Much thought should be given to the manufacture of ashlar units by any producer contemplating this business. It opens a field much wider than possible in the past and gives a medium about which architects and the better class of contractors are frankly enthusiastic.

Some of the most outstanding jobs of the past year in the concrete-masonry field have been of concrete-ashlar construction. Two of these are the Federal Penitentiary at Lewisburg, Pa., and the New York State Reformatory at Wallkill. To the good producer who maintains an aggressive merchandising organization the manufacture of concrete masonry opens a productive field. However, he must realize that to do business in this line, as well as in aggregates, he is confronted with a task of selling that requires careful cultivation of the field and much work. True, many of his potential customers in the concrete-masonry field are already customers in the aggregate field. This should help him considerably in establishing his business and not make it as difficult as for those manufacturers who have had to start at scratch and build up a trade.

Cement Clinker *(from page 28)*

white-iron alloy. Therefore, when it was decided to redesign the plates, attention was given, among other details, to this feature, and in order to establish the approximate temperature range encountered in the new plates, small "fusible," metallic plugs were inserted in various plates at different points. After several days' continuous operation the kiln was shut down and the plates and lining were inspected and found to be completely intact, including the plugs themselves, none of which had melted, and showing that at no time had the plates reached a temperature of 1,200 deg. F. So favorable a result was not expected, otherwise lower melting-point plugs would have been used.

Comparison of Plates.—This served to demonstrate fully, however, the superior cooling of the new type of plate, which can be accounted for by the fact that the ratio of cooling air to metal had been greatly increased and at the same time there were no uncooled areas as existed in the original design. Incidentally, also, the air distribution had been materially improved, as well as the clinker-spreading action which was found to be altogether satisfactory, yet showering of the clinker had been eliminated.

A comparison of the plates follows:

	Projected Area	Weight	Blowing Orifices
Original plate	408 sq. in.	230 lb.	3 2½ in. diameter
New plate	226 sq. in.	90 lb.	6 2½ in. diameter

The great saving in the weight of metal in the newer plate, coupled with more efficient plate cooling, not only allows the use of high-grade materials for plates, but also provides a high safety factor as regards operating temperatures. With the original plates in the kiln it was thought advisable to blow a considerable portion of the air volume through the plates traversing the upper circle of the kiln in order to guard against the possibility of overheating. With the new plates this practice is no longer necessary, although the arrangement is such that upper air may be employed when starting a kiln from cold, in order to reduce dusting. When the kiln attains its normal operating temperature this upper air, under valve control, would be cut down. This feature provides, of course, the maximum volume of air through the clinker bed, resulting in high operating efficiency.

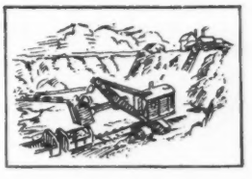
Factors Controlling Cooling.—The first stage of cooling as carried out in the recuperator is naturally dependent—so far as exit-clinker temperature is concerned—upon two factors: (1) the relative amount of cooling air employed, and (2) the size of the clinker nodules. In the plant under discussion cooling air is limited to combustion requirements and the clinker is coarse in comparison with that produced in many other plants, particularly those employing the wet process. In case a lower exit-clinker temperature should be required, it is altogether feasible to increase the air volume through the liner plates beyond combustion requirements, employing more plates if necessary and by-passing the excess air through a stack carried on the firing-hood. Conversely, in making an application in a plant already possessing ample cooling facilities, with fuel economy the leading motive, the plate surface may conceivably be reduced and the air volume suited to the combustion requirements alone.

It will be gathered from all this that the recuperator design is susceptible of considerable flexibility and may be readily adapted to any plant condition encountered, in no case requiring alterations of the plant lay-out or structural changes in the buildings, the kilns and accessory equipment. The installation of a recuperator with the necessary blast-fan and the main air-duct, serving one or more units, completes the job and calls for no excavation and foundations other than a small amount of grout under the fan and structural supports carrying the wind-box, requiring also the minimum of expenditure in time and labor. Of course, it is one thing to design a fuel-saving device and quite another to be able to install it at a price commensurate with the monetary value of the savings effected, for when all is said and done, the return on the investment, after writing off depreciation, interest charges and maintenance costs, is the final measure of worth. From a rather extended observation of the recuperator in service, it may be said with considerable assurance that, after deducting these fixed charges, the initial cost of the installation should be returned within a period of one year, basing this statement on results reasonably certain of fulfillment in the average plant.

MEN OF THE INDUSTRY

A. L. WORTHEN

MR. WORTHEN, identified with the crushed-stone industry since his graduation from Worcester Polytechnic Institute in 1910, has been vice-president and general manager of the Connecticut Quarries Co., Inc., since 1915. He is also general manager of the Certified Sand Co., New Haven. Since 1911 the quarry company has increased its operations from four crushing plants to nine crushing plants and four distributing plants. Mr. Worthen redesigned and modernized all the original plants and also designed and supervised the construction of the additional plants. Besides his business responsibilities he is serving his third term as president of the National Crushed Stone Assn.



Personal Mention

Col. E. J. McMahon, well known in engineering circles and to nonmetallic mineral producers as executive secretary of the St. Louis Quarrymen's Assn., was recently appointed street commissioner of the city of St. Louis.

A. J. Boase has been appointed manager of the structural and technical bureau of the Chicago main office of the Portland Cement Ass'n., succeeding **W. E. Hart.** Mr. Hart will devote his entire time to the development of architectural uses of concrete. **O. E. McMullen,** formerly professor of civil engineering at Drexel Institute, has been appointed regional structural engineer at Philadelphia. **M. J. McMillan,** formerly regional structural engineer at Chicago, has been transferred to a similar position in the Washington office, **J. R. Goetz** taking his place in the Chicago office.

John J. Ginsburg, Detroit, Mich., has been elected president of the Shawnee Stone Co., Bloomington, Ind., succeeding **J. L. Torphy** who recently resigned.

Dr. M. Louis, chief of the patent bureau of the Krupp Works, Essen, Germany, arrived in this country recently to confer with steel interests in connection with the production of a stainless steel beer barrel of a type sold by the Krupp interests in Germany.

R. McElheny was recently made manager of the plant of the Erie Stone Co., Ft. Wayne, Ind. The company has moved its office from 218 Central Bldg. to the plant on Taylor St.

Carl Forsbeck, formerly Tacoma, Wash., representative of the Portland Cement Ass'n, has been appointed city engineer of that city, succeeding **C. E. Putnam.**

R. E. Hellmund has been appointed chief engineer of the Westinghouse Electric & Mfg. Co. Mr. Hellmund was born in Gotha, Germany, and was educated in the universities of Ilmenan and Charlottenburg.

L. H. States, formerly at the Philadelphia office of the Allis-Chalmers Mfg. Co., has been transferred to Syracuse, N. Y., and will cover the central part of the state.

J. E. Otis, Jr., former general manager of the Alemite Corp., was recently appointed to the same position with the Stewart-Warner Corp. Frank A. Hiter, formerly sales manager for Alemite, was made general sales manager for Stewart-Warner and its subsidiaries.

Prevost Hubbard, chemical engineer of the Asphalt Institute, recently addressed the mid-year meeting of the American Petroleum Institute at Tulsa, Okla., warning them that if the use of liquid asphalt products is to grow as it has done in the past few years the quality of these products must be maintained. Mr. Hubbard also discussed other phases of the subject such as the development of accepted tests and other technical phases.

Fred E. Wolf has been appointed sales engineer for the Pittsburgh district by the W. W. Sly Mfg. Co. He has had 17 years of engineering and sales experience in connection with positive dust collection and blast cleaning equipment.

Obituary

Clifton R. Hoolihan, Jr., 20, son of Clifton R. Hoolihan, president of the Moraine Gravel & Sand Co., Dayton, O., died of an electric shock at the company's plant on May 16. The young man had been employed at the plant for six months and was killed as he attempted to throw a switch in the power house. Death was attributed to the passing through his body of the 440-volt current and the fact that he had a weak heart.

William H. Hassenpflug, 69, former vice-president of the Harnischfeger Corp., died recently at his home in Milwaukee, Wis. He had retired from his position a year ago due to failing health.

Charles Kriser, 52, president and founder of the Industrial Plants Corp., New York, N. Y., died at his home in Flushing, N. Y., on May 15 after a long illness.

Elmore I. Mitchell, 59, president of the Southern Lime & Chemical Co., and the Mitchell Equipment Co., died recently at his home in Calera, Ala. He is survived by his widow, a daughter and two sons.

Daniel Kern, president of the Columbia Contract Co., producers of sand, gravel and crushed rock at Portland, Ore., died recently.

Albert Branham, 58, former superintendent of the Midwest Stone Co., Greencastle, Ind., died recently at his home in Indianapolis following an illness of six weeks.

Dr. Otto Polysius, head of the Polysius Corp., Dessau, Germany, manufacturers of cement mill equipment, died recently after a long illness.

John E. Bloeser, 48, Wisconsin manager for the Keasbey & Mattison Co., died suddenly at his home in Milwaukee, Wis., of a heart attack.

Frank W. Bunn, 68, plant manager of the John A. Roebling's Sons Co., Trenton, N. J., died recently. He had been connected with the company for 27 years.

Otto Ladwig, 69, president and treasurer of Otto Ladwig & Sons, Inc., Milwaukee, Wis., died at his home in that city on May 30 from a heart attack. He had been in the sand and gravel business since 1915 and was also engaged in the manufacture of concrete products. Associated with him in the firm bearing his name, which was incorporated in 1925, were five sons, Emil F., Walter O., Otto, Jr., Alfred A., and Hugo M., and a daughter, Mrs. Elsie L. Petersdorf. His widow and two other daughters also survive.

Coming Events

June 15, 1933 (?). Atlantic City, N. J. Fifteenth Annual Convention, National Lime Assn., Ambassador Hotel. Norman G. Hough, pres. and gen. mgr., 927 15th St. N. W., Washington, D. C.

June 25-30, 1933. Chicago, Ill. Sixth Midwest Engineering and Power Exposition. Stevens Hotel. G. E. Pfisterer, director, 308 W. Washington St., Chicago, Ill.

June 26-30, 1933. Chicago, Ill. Annual meeting, American Society for Testing Materials, Stevens Hotel. C. L. Warwick, secretary-treasurer, 1315 Spruce St., Philadelphia, Pa.

June 26-30, 1933. Chicago, Ill. Semi-Annual Meeting, American Society of Mechanical Engineers, Stevens Hotel. Society Headquarters, 29 West 39th St., New York, N. Y.

Aggregates Shipments

By H. H. HUGHES, A. T. COONS, F. G. TRYON and E. E. BERQUIST

Bureau of Mines, Department of Commerce

HOW has the decline in aggregate production compared with that of business in general and with activities in the construction industry?

It is easier to compare such unlike quantities as tons of sand, barrels of cement, and square yards of pavement if they are reduced to a common denominator. This is done in Table I, in which each item is expressed as an "index number" or percentage of the year 1928. For example, if the production of sand and gravel in 1928 is represented by the number 100, then the production in 1929 will be represented by the number 105, or 5 per cent. more than in 1928. In the same way the production for 1930 will be represented by 99 and that for 1931 by 80. By this means it is clear at once that the year 1931 is 20 per cent. below the base year, and this ease of comparison has led American executives to rely more and more on such "index numbers" in watching the movements of business.

Fig. 1 shows the indexes for the several aggregates plotted alongside those for other market barometers, so that all may be compared at a glance. All the indexes have been coming down since the "boom" year 1929, with one exception, the contract awards for concrete pavement.

The chart again brings out the relative decline in railway shipments of aggregates, as compared with total production. On a percentage basis the production of crushed stone declined 11 points from 1928 to 1931, but railway shipments of crushed stone declined 27 points.

Portland-cement shipments are an important barometer of demand, since cement and aggregates are joint raw materials consumed simultaneously. For some years, however, there has been a gradual decline in the ratio of cement to aggregates. The change is believed to reflect improvements in the quality of cement and advances in the art of mixing concrete (by which concrete of equivalent quality and strength is now produced by a relatively smaller quantity of cement), as well as an increase in the proportion of crushed stone, sand, and gravel used in low-type roads. The tendency is shown in Fig. 1. Throughout recent years the cement index has declined more than the production index for either sand and gravel or crushed stone. Thus, the production of crushed stone declined 11 points from 1928 to 1931, and that of sand and gravel 20 points, but the production of cement declined 28 points.

Low-Type Roads.—Since 1930 no complete mileage figures for new low-type roads have been compiled. The available evidence, however, indicates that the construction of gravel- and stone-surfaced roads increased during 1931 and 1932, due partly to efforts to provide employment. The sales of cut-back asphalt, used for mixed-in-place bituminous road surfacing, increased from 129,695 short tons in 1929 to 446,413 tons in 1931, representing 16 per cent. of the total sales of asphalt. Refinery shipments of road oils amounted to 5,033,000 bbl. in 1931 and 6,648,000 bbl. in 1932; the final sales figure, however, may vary considerably due to the common practice of selling other similar petroleum prod-

Table I—INDEX NUMBERS OF ANNUAL PRODUCTION AND RAILWAY SHIPMENTS OF AGGREGATES, AND OF OTHER MARKET INDICATORS

	1928	1929	1930	1931	1932
Sand and Gravel:					
Total recorded production, including government agencies	100	105	99	80	.....
Rail shipments	100	95	86	63	34
Water shipments, Pittsburgh	100	109	102	64	27
Crushed stone:					
Total recorded production, including government agencies	100	102	100	89	.....
Rail shipments	100	95	90	73	43
Furnace slag:					
Rail shipments	100	112	125	50	24
Cement:					
Total shipments	100	97	90	72	46
Asphalt (*a*):					
Shipments for paving, including cut-back asphalt	100	110	105	102	83
General Business activity:					
Industrial production	100	107	86	73	58
Construction-contract awards:					
All buildings, floor-space index	100	82	53	38	16
Concrete pavements, yardage index	100	94	98	91	65

(*a*) Based on reports by A. H. Redfield, U. S. Bureau of Mines; figure for 1932 estimated by the authors.

Table II—BALLAST EXPENDITURES, AS REPORTED BY CLASS I RAILROADS, AND SALES OF RAILROAD BALLAST, AS REPORTED BY PRODUCERS OF CRUSHED STONE, GRAVEL AND SAND

	1928	1929	1930	1931	1932 (preliminary)
Ballast expenditures by Class I railroads (*a*):					
Charged to operating expenses (*b*)	$19,769,000	$21,377,000	$13,659,000	$ 8,602,000	$5,300,000*e*
Charged to capital account (*d*)	$15,748,000	$17,049,000	$11,455,000	$ 5,319,000	$2,809,000
Total expenditures	$35,517,000	$38,426,000	$25,114,000	$13,921,000	$8,109,000
Ballast sold or used, as reported by producers					
Crushed stone.....*short tons*	16,880,870	16,546,490	12,817,800	6,812,890	3,980,000*e*
Gravel ballast, not including fill *short tons* (*f*)	25,150,052	27,332,529	16,227,543	8,814,908	5,750,000*e*
Sand ballast, not including fill.*short tons*	2,536,623	2,505,408	1,971,788	1,020,513	
Total tonnage.....*short tons*	44,567,545	46,384,427	31,017,131	16,648,311	9,730,000*e*
Total value, at pit	$21,682,292	$23,210,298	$16,325,418	$ 8,622,228	$5,030,000*e*
Index numbers:					
Ballast expenditures, Class I roads	100	108	71	39	23
Ballast reported by producers....*tonnage*	100	104	70	37	22*e*
Ballast reported by producers.....*value*	100	107	75	39	23*e*

(*a*) Includes cost of other types of ballast, also freight charges when purchased off lines, and cost of work-train service and unloading. (*b*) As reported to the Interstate Commerce Commission, accounts No. 218 and No. 219. (*c*) Estimated from reported expenditures for maintenance of way and structures, from data in *Railway Age* and from other information. (*d*) Courtesy of the Bureau of Railway Economics. (*e*) Estimated from reported expenditures. (*f*) Does not include railroad gravel for fills and other purposes, amounting to 2,395,000 tons in 1928; 3,508,000 in 1929; 4,485,000 in 1930; and 2,028,000 in 1931.

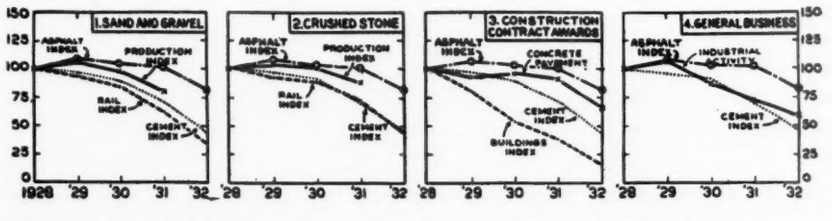


Fig. 1. Indexes of total production and railway shipments of aggregates compared with indexes of cement production, construction contracts, and general business. Note that railway shipments have fallen faster than production (squares 1 and 2), that paving has held up better than building (square 3), and that industrial activity, formerly closely parallel to the cement index, was above it in 1932.

Table III—BUSINESS INDICATORS OF THE AGGREGATE MARKET
(All figures are index numbers, the average for 1928 being taken as 100.0)

Quarter	Rail Shipments of Aggregates: Sand and Gravel	Rail Shipments of Aggregates: Crushed Stone	Rail Shipments of Aggregates: Furnace Slag	Rail Shipments of Aggregates: Total Accounted For (*a*)	Water Shipments Sand and Gravel, Pittsburgh	Portland Cement Shipments (*b*)	General Business Activity (*c*)	Construction Contracts Awarded: All Buildings (*d*)	Construction Contracts Awarded: Concrete Pavements (*e*)
1928, 1st	46.3	51.2	64.4	48.7	44	53	99	91	70
2nd	111.7	112.5	100.7	111.0	105	116	98	117	146
3rd	144.2	138.8	125.7	141.2	134	142	100	98	121
4th	97.8	97.4	109.1	99.1	117	90	103	93	63
1929, 1st	38.2	42.0	65.4	41.1	41	48	109	78	45
2nd	104.9	103.2	98.5	104.2	110	112	113	99	153
3rd	145.7	145.7	155.7	146.6	153	144	110	84	109
4th	91.2	89.3	128.3	94.6	132	82	97	66	70
1930, 1st	39.9	41.5	110.2	45.5	57	47	95	51	73
2nd	105.1	109.4	175.7	111.5	128	112	93	66	150
3rd	129.0	132.0	148.4	131.5	141	134	82	62	103
4th	71.5	78.0	66.6	73.3	83	69	75	42	67
1931, 1st	30.2	35.8	31.6	31.8	30	39	77	38	105
2nd	84.2	93.9	53.1	84.5	77	94	79	46	143
3rd	88.8	106.7	61.0	91.9	94	101	70	39	78
4th	46.9	57.0	54.8	50.4	55	54	65	28	37
1932, 1st	15.8	21.0	18.9	17.2	13	24	63	17	32
2nd	38.1	46.2	26.7	39.4	35	54	56	17	88
3rd	47.8	63.7	27.8	50.3	35	68	54	17	87
4th	32.5	42.4	22.4	34.1	24	37	58	13	55

(*a*) Includes water shipments of sand and gravel in the Pittsburgh District. (*b*) Monthly Cement Report, U. S. Bureau of Mines. (*c*) Index of physical volume of production in manufacturing and mining as determined by the Federal Reserve Board; recomputed to base 1928=100.0. (*d*) Based on floor space as reported by F. W. Dodge Corp. Covers 37 states east of Rocky Mountains. (*e*) Based on square yardage as reported by Portland Cement Assn.

ucts for highway purposes. Cut-back asphalt is included in the total paving asphalt figures plotted in Fig. 1.

An example of unusual activity in secondary-road construction is revealed in Pennsylvania state reports for 1932, which show that the highway department purchased nearly 3,000,000 tons of stone for sub-base construction. Most of this material was field stone procured from farmers adjacent to the road-construction projects, and more than $1,000,000 was spent for it. Some of the aggregates used for surfacing these roads also were bought locally, although commercial plants apparently supplied a large part.

Construction Contracts.—The sharpest decline shown in Fig. 1 has occurred in the index of building-contract awards, based on floor space rather than value in order to avoid the deceptive influence of changing prices. For 1931 the building contract index stood at 38, or 62 per cent. below 1928, the base year; and in 1932 it fell to the unprecedented low of 16. Concrete-pavement awards, on the other hand, have held up remarkably well. In 1931 the pavement index stood at 91, or only 9 points below the peak, although it fell far below this level in 1932.

General Business.—In the last square of Fig. 1 is shown the index of general-business activity. After rising to a peak of 107 in 1929, it declined to 86 in 1930, to 73 in 1931, and to 58 in 1932.

The Indexes for 1932.—All the curves in Fig. 1 dropped sharply from 1931 to 1932, the declines ranging from 58 per cent. for building construction to about 19 per cent. for the shipments of paving asphalt. Judging from past experience, the index for aggregates production should fall to a point somewhat above the index for cement shipments, perhaps not far from the level of general industrial activity.

Seasonal Trends of the Aggregates Market.—The seasonal trends of the aggregates market are developed in Fig. 2. Although railway shipments are declining in relation to total production, they are worth studying as an indication of the trend, especially the sharp fluctuations from summer to winter so characteristic of these construction materials.

In normal times the seasonal pattern is curiously regular. From the winter low, shipments rise sharply in the second quarter, reach a peak in the third quarter, and decline in the fourth quarter.

Both sand-and-gravel shipments and crushed-stone shipments parallel Portland-cement shipments with remarkable closeness. (As cement figures are reported monthly, the index is plotted as a curve in contrast with the quarterly averages for the aggregates.) It is clear that if allowance is made for the gradual change in the ratio of cement to aggregates, the Portland-cement barometer may be taken as a faithful measure of the consumption of aggregates.

The most striking feature of the seasonal analysis is the spring peak

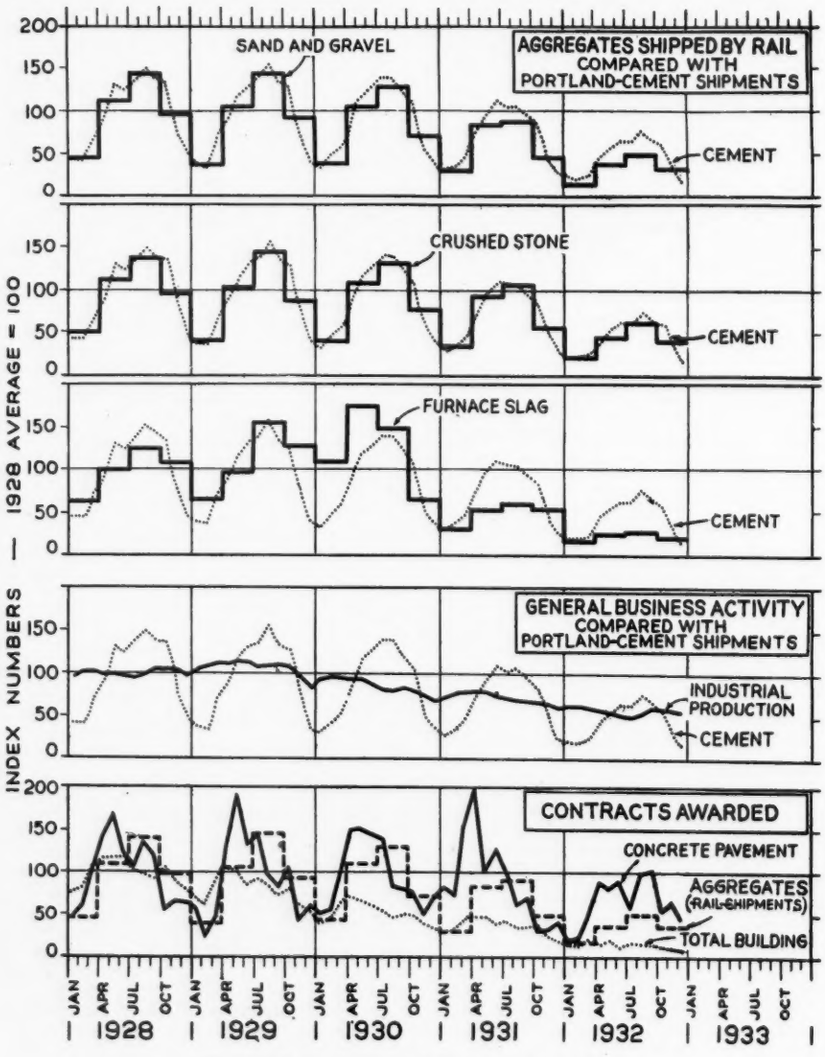


Fig. 2. Seasonal trends of the aggregates market.

Table IV.—SUMMARY OF MOVEMENT OF AGGREGATE MATERIALS AND INDICATORS OF CONSTRUCTION ACTIVITY IN THE FOURTH QUARTER OF 1932

	Fourth Quarter			Calendar Year to December 31		
	1932 Oct.-Dec.	1931 Oct.-Dec.	Change from Last Year	1932	1931	Change from Last Year
Rail shipments, Class I roads (*a*) (excludes nonrevenue railroad ballast)						
Sand and gravel.....*short tons* (*b*)	6,954,000*	10,047,018	−30.8%	28,721,000	53,561,587	−46.4%
Crushed stone.....*short tons* (*c*)	3,743,000*	5,021,867	−25.5	15,287,000	25,861,475	−40.9
Furnace slag.....*short tons*	493,000*	1,203,747	−59.0	2,105,000	4,401,162	−52.2
Water shipments.....*short tons* (*d*)						
Sand and gravel, Pittsburgh District.....	275,735	644,583	−57.2	1,250,000	3,003,803	−58.4
Sand and gravel, coastwise from Long Island (*e*).....	(*f*)	(*f*)	(*f*)	4,257,208	8,880,766	−52.1
Sand and gravel, Delaware River above Philadelphia (*g*).....	(*f*)	(*f*)	(*f*)	2,020,700	2,749,781	−26.5
Crushed stone, Hudson River, Middle Section (*h*).....	(*f*)	(*f*)	(*f*)	2,128,271	4,000,194	−46.8
Exports to all countries						
Sand and gravel.....*short tons*	21,563	59,262	−63.6	96,015	217,870	−55.9
Imports from all countries						
Sand and gravel.....*short tons* (*i*)	28,797	167,722	−82.9	212,458	420,721	−49.5
Total aggregates accounted for.....*short tons*	11,465,000	16,917,215	−32.2	55,770,179	102,458,768	−45.6
Portland cement shipped (*j*).....*bbl.*	16,360,000	23,658,000	−30.8	80,579,000	126,465,000	−36.3
Construction contracts awarded						
Total buildings, floor space (*k*).....000 *sq. ft.*	30,071	68,429	−56.1	155,597	365,841	−57.5
Concrete pavements (*l*).....000 *sq. yd.*	20,363	13,734	+48.3	96,827	134,489	−28.0
General business activity						
Index of industrial production (*m*).....	58	65	−10.8	58	73	−20.5

(*a*) As reported by the Interstate Commerce Commission. (*b*) Excludes glass and molding sand. (*c*) Excludes fluxing stone. (*d*) As reported by Chief Statistician, Board of Engineers for Rivers and Harbors. (*e*) Coastwise shipments from Hempstead Harbor, Huntington Bay, and Port Jefferson Harbor only. (*f*) Not reported quarterly. (*g*) Delaware River between Philadelphia and Trenton, internal shipments and local. (*h*) Hudson River, New York, Middle Section, shipments downbound and local. (*i*) Excludes glass sand. (*j*) Bureau of Mines. (*k*) F. W. Dodge Corp. (*l*) Portland Cement Assn. (*m*) Federal Reserve Board; recomputed to base 1928=100.
*Preliminary figures.

of construction contracts. Both concrete-pavement awards and building awards tend to reach a high point in April or May. The peak of contracts is followed later by a peak of aggregate shipments, indicating that contract awards may be used as a forecaster of the demand for aggregates.

Aside from the spring peak, building contracts have been going downward in the last few years. Concrete-pavement awards, on the other hand, have held up relatively well, because of heavy federal and state expenditures. In April, 1931, they reached an all-time peak, which was followed, however, by a decline to new lows in the first quarter of 1932.

Of special interest is the trend of contract awards in 1932. In building contracts the usual spring peak failed to appear and throughout the year the index for floor space remained at the low level of 20 or less, hardly a fifth of normal. In concrete-pavement awards, also, the spring peak was much below normal, reaching less than half of that for the corresponding period of 1931. Some indication of a reviving demand for aggregates, how-

Table V.—TOTAL PRODUCTION OF SAND AND GRAVEL, AND CRUSHED STONE, 1928-1932

	1928	1929	1930	1931	1932
Sand and gravel, includes glass and molding sand and railroad ballast (*a*).....	209,118,868	222,571,905	197,051,726	153,479,044	87,500,000*b*
Crushed stone, includes railroad ballast (*a*).....	91,265,360	92,721,260	87,110,890	72,624,110	44,800,000*b*

(*a*) U. S. Bureau of Mines. (*b*) Estimated from railway-shipments data.

Table VI.—QUARTERLY SHIPMENTS OF AGGREGATE MATERIALS, 1928-1932 (*short tons*)

Quarter	Rail Shipments Originated by Class I Roads (excluding non-revenue railroad ballast) (*a*)			Water Shipments, Sand and Gravel Pittsburgh District (*d*)	Total Sand and Gravel Accounted for	Total Aggregate Accounted for	Exports of Sand and Gravel	Imports of Sand and Gravel (*e*)
	Sand and Gravel (*b*)	Crushed Stone (*c*)	Furnace Slag					
1928: 1st	9,913,640	4,517,918	1,415,218	513,738	10,427,378	16,360,514	33,500	30,143
2nd	23,913,508	9,919,398	2,212,033	1,233,951	25,147,459	37,278,890	220,437	245,720
3rd	30,879,614	12,242,381	2,760,955	1,574,363	32,453,977	47,457,313	271,475	269,062
4th	20,948,474	8,587,601	2,395,427	1,367,187	22,315,661	33,298,689	211,956	243,297
1929: 1st	8,188,277	3,703,310	1,435,320	481,914	8,670,191	13,808,821	63,800	31,032
2nd	22,463,168	9,099,575	2,162,164	1,289,629	23,752,797	35,014,536	129,393	380,581
3rd	31,208,391	12,844,051	3,419,409	1,793,165	33,001,556	49,265,016	161,074	540,574
4th	19,528,764	7,873,764	2,817,654	1,552,675	21,081,439	31,772,857	132,110	714,200
1930: 1st	8,543,725	3,657,053	2,420,348	663,699	9,207,424	15,284,825	60,934	36,624
2nd	22,502,212	9,647,859	3,858,341	1,501,053	24,003,265	37,509,465	82,087	660,104
3rd	27,624,422	11,641,408	3,257,935	1,650,844	29,275,266	44,174,609	97,172	908,700
4th	15,313,525	6,879,865	1,463,307	969,420	16,282,945	24,626,117	82,897	227,422
1931: 1st	6,466,043	3,157,102	692,831	351,855	6,817,898	10,667,831	33,767	11,374
2nd	18,030,953	8,275,823	1,165,885	904,926	18,935,879	28,377,587	65,269	135,963
3rd	19,017,573	9,406,683	1,338,699	1,102,439	20,120,012	30,865,394	59,572	79,166
4th	10,047,018	5,021,867	1,203,747	644,583	10,691,601	16,917,215	59,262	159,173
1932: 1st	3,374,175	1,848,455	414,154	151,493	3,525,668	5,788,277	16,548	3,350
2nd	8,148,606	4,075,528	587,337	412,251	8,560,857	13,223,722	27,718	66,485
3rd	10,244,752	5,619,874	611,214	410,980	10,655,732	16,886,820	30,186	90,381
4th	6,954,000*	3,743,000*	493,000*	275,735	7,230,000*	11,465,000*	21,563	28,797

(*a*) As reported by the Interstate Commerce Commission. (*b*) Excludes glass and molding sand. (*c*) Excludes fluxing stone. (*d*) As reported by the U. S. Engineers. (*e*) Excludes glass sand.
*Preliminary figures.

ever, is found in the rise of pavement contracts during the third and fourth quarters. For the fourth quarter the pavement-awards index stood at 55, as compared with 37 for the corresponding period of 1931. The index for the year, however, was 65 for 1932 and 91 for 1931.

Railroad Ballast.—The demand for ballast has been hit especially hard in recent years. Forced to practice drastic economies, the railroads spent on ballast in 1932 42 per cent. less than in 1931 and 79 per cent. less than in 1929. The total ballast expenditures of Class I roads in 1932 amounted to about $8,109,000. Of this $5,300,000 was charged to operating expenses (partly estimated), and $2,809,000 was charged to capital account. In 1929 the total ballast expenditures amounted to $38,426,000. For the last five years the figures are:

Ballast Expenditures of Class I Railroads

1928	$35,517,000
1929	38,426,000
1930	25,114,000
1931	13,921,000
1932	8,109,000*

* Partly estimated from preliminary reports.

In railroad accounting the ballast expenditures include chats, cinders, burned clay, and slag as well as crushed stone, gravel, and sand, and also include the cost of moving the ballast from the pit and unloading it at the place of use. However, 60 per cent. of the reported expenditure represents the pit-mouth cost of the crushed stone, gravel, and sand used, so that ballast expenditures as reported by the carriers are an excellent indicator of ballast sales, as reported by the producers. This is clear when the two sets of figures are expressed as index numbers to allow ready comparisons:

	1928	1929	1930	1931	1932
Index of ballast expenditures, as reported by Class I roads	100	108	71	39	23
Index of ballast sales, as reported by crushed-stone, gravel, and sand producers	100	107	75	39	

From what is known of railroad expenditures it is estimated that the production of crushed-stone ballast in 1932 amounted, in round numbers, to 3,980,000 tons, as against 6,812,890 tons in 1931 and 16,546,490 tons in 1929. In comparison with 1931 crushed-stone ballast thus shows a decrease of 42 per cent., and in comparison with the "boom" year 1929 a decrease of 76 per cent.

The production of gravel-and-sand ballast in 1932 is estimated at 5,750,000 tons, not including the material used for fills. This compares with 9,835,421 tons in 1931 and 29,837,937 tons in 1929. Gravel-and-sand ballast thus shows a decrease of about 42 per cent. below 1931, and a decrease of 80 per cent. below 1929.

The tonnage of ballast follows:

	Crushed-stone Ballast	Gravel-and-Sand Ballast	Totals
1928	16,880,870	27,880,870	44,567,545
1929	16,546,490	29,837,937	46,384,427
1930	12,817,800	18,199,331	31,017,131
1931	6,812,890	9,835,421	16,648,311
1932*	3,980,000	5,750,000	9,730,000

* Preliminary.

Tables IV to VI present recent data on the production and shipments of aggregates, Table IV giving a summary of the movement of aggregate materials in the last quarter of 1932, Table V the production of sand and gravel and crushed stone from 1928 to 1932, and Table VI the quarterly shipment of aggregates for the same years.

These statistics should be studied in conjunction with the article, *Aggregate-Production Data Show Trend to Motor-Truck Transportation*, published in the May, 1933, issue of PIT AND QUARRY. They furnish statistical evidence of the growing importance of the motor truck as a medium of transporting nonmetallic minerals from their sources in competition with the railroads.

Chain Belt Appoints Four New Distributors

The Chain Belt Co., Milwaukee, Wis., recently added four new distributors to its sales organization. These are: The Blaisdell-Folz Equipment Co., Cincinnati, O.; The R. L. Harrison Co., Inc., Albuquerque, N. M.; The Keller Tractor & Equipment Co., Detroit, Mich.; and the Ray Corson-Elkins Co., Denver, Colo.

Heltzel Appoints New Equipment Distributors

The Heltzel Steel Form & Iron Co., Warren, O., recently appointed the following new distributors: F. H. Burlew Co., 221-225 W. Huron St., Chicago, Ill.; Arthur W. Davis, 324 W. Georgia St., Indianapolis, Ind.; Industrial Machinery Co., 430-32 Minnesota Ave., Kansas City, Kans.; and H. O. Penn Machinery Co., 140th St. and East River, New York, N. Y. All of the above handle Heltzel bin, batcher and bulk-cement equipment. The Cook & Brown Lime Co., Oshkosh, Wis., was also appointed to handle the company's complete line.

Sprout, Waldron Office Moved into New Jersey

Sprout, Waldron & Co., Inc., Muncy, Pa., recently closed its office in New York City and transferred its business to the office at Westfield, N. J.

Worthington Pump Moves Main Offices to Plant

The Worthington Pump & Machinery Corp. opened a new office building on May 1 adjacent to its plant at Harrison, N. J. The general and executive offices, formerly at 2 Park Ave., New York City, have been moved to this building for better coordination with manufacturing and sales operations. The New York sales office remains at 2 Park Ave.

Bucyrus-Erie Acquires the Armstrong Mfg. Co.

The Bucyrus-Erie Co., South Milwaukee, Wis., recently acquired the drill business of the Armstrong Mfg. Co., and Armstrong drills and bit sharpeners are now being sold by that company. Both companies are pioneers in their respective lines, as Armstrong has had 66 years of experience in drill manufacture and Bucyrus-Erie has been making excavating equipment for 53 years. George R. Watson, formerly president of the Armstrong Mfg. Co., is now associated with the Bucyrus-Erie Co., and is in charge of the drill business.

Republic Steel Sells Belt Fastener Dept.

The Standard Belt Fastener Co., Unionville, Conn., has purchased the belt fastener department of the Republic Steel Corp., Upson Nut Division. The same management in manufacturing and sales will be continued. The new company is headed by William C. Duff, inventor of the "Self-Aligning" belt fasteners.

Pioneer So. California Machinery Company Sold

The Brown-Bevis Co., Los Angeles, Cal., one of the oldest and largest machinery dealers in the West, and which has been in receivership for nearly two years, was sold on May 10th to a new organization, consisting of Walter Parsons, formerly general manager of the company; J. A. Beynon, formerly secretary and treasurer of the Kimball Krogh Pump Co.; C. M. Weinberg, president of the California Equipment Co.; and B. G. Rhodes.

Earle C. Bacon, Inc. Move New York Office

Earle C. Bacon, Inc., engineers, plant designers, and manufacturers of crushers, screens, elevators, conveyors and other quarry equipment, has moved its New York City office to No. 17 John St., after 39 years at its former location at 26 Cortlandt St.

Form New Company for Electric Repair Work

The Rockford Electric Equipment Co., Rockford, Ill., has been incorporated by former employees of the Rockford Power Mach'y Co. of that city. They are S. J. Beishir, P. H. Donohoe, D. T. Dwyer and Wilson Smith. They have opened a completely-equipped repair shop with all modern facilities for overhauling and rebuilding electric motors and other power plant equipment. The company also reconditions such equipment as motors, generators, air compressors, welders, etc.

Latest Portland-Cement Statistics

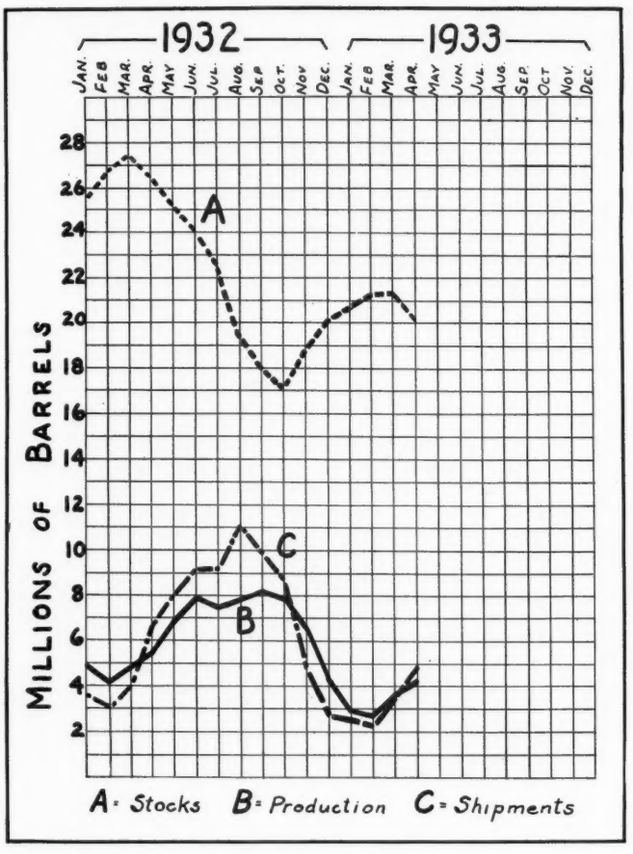


Chart showing monthly production, shipments and stocks on hand at end of month, from January, 1932, to April, 1933

THE Portland cement industry in April, 1933, produced 4,183,000 bbls., shipped 4,949,000 bbls. from the mills, and had in stock at the end of the month 20,532,000 bbls. Production of Portland cement in April, 1933, showed a decrease of 23.6 per cent. and shipments a decrease of 24.3 per cent., as compared with April, 1932. Portland cement stocks at mills were 22.5 per cent. lower than a year ago.

The statistics here given are compiled from reports for April, received by the Bureau of Mines, from all manufacturing plants except four, for which estimates have been included in lieu of actual returns.

DISTRIBUTION OF CEMENT

Shipped to—	March (*a*)		April		Year	
	1932	1933	1932	1933	1931 (*b*)	1932 (*c*)
Alabama	35,482	102,982	44,565	117,113	1,250,778	390,650
Alaska	132	396	524	1,074	12,169	11,282
Arizona	20,293	11,215	15,893	10,305	438,135	161,178
Arkansas	12,353	40,750	14,534	77,517	1,223,213	269,539
California	487,421	408,287	455,498	410,282	6,616,135	4,671,688
Colorado	26,601	21,589	61,974	35,589	775,540	492,411
Connecticut	42,557	31,371	94,490	45,492	1,476,613	806,700
Delaware	10,545	11,927	28,895	32,078	347,423	297,838
Dist. of Columbia	68,265	74,034	97,351	73,324	1,249,676	1,068,936
Florida	31,427	56,114	39,674	58,331	764,671	427,078
Georgia	99,498	89,630	82,155	64,568	1,714,033	1,132,281
Hawaii	12,565	16,515	29,953	14,145	267,334	237,443
Idaho	10,944	7,930	12,480	10,062	189,317	94,380
Illinois	118,689	125,846	335,544	171,203	7,925,435	5,822,358
Indiana	69,500	53,239	157,969	108,666	3,880,234	3,000,507
Iowa	46,383	40,268	145,776	97,511	3,799,665	2,591,364
Kansas	55,666	90,814	126,952	90,448	2,131,790	1,044,149
Kentucky	54,024	60,412	90,728	113,952	1,628,002	1,369,978
Louisiana	72,511	72,703	58,675	48,230	3,906,467	1,286,474
Maine	6,550	5,992	26,384	15,658	527,376	409,620
Maryland	59,289	50,895	140,479	81,995	2,013,929	1,558,894
Massachusetts	94,976	51,791	209,812	94,101	3,043,584	2,124,238
Michigan	93,462	58,309	179,013	98,938	5,582,116	3,428,358
Minnesota	60,441	24,962	164,514	108,377	3,716,068	3,146,044
Mississippi	27,989	68,898	25,123	45,380	524,804	466,696
Missouri	115,809	102,698	250,745	140,758	4,259,370	3,453,258
Montana	8,164	10,991	18,034	14,012	263,119	149,958
Nebraska	35,266	31,797	68,633	173,435	1,903,200	770,941
Nevada	24,762	28,198	36,163	41,035	133,403	628,978
New Hampshire	7,340	9,842	23,710	14,736	437,493	266,377
New Jersey	135,539	105,287	297,700	184,998	5,065,654	2,849,559
New Mexico	19,237	32,000	24,577	39,006	264,507	173,803
New York	584,409	279,633	970,867	503,554	19,755,653	11,045,374
North Carolina	41,032	37,203	55,225	39,612	1,015,225	448,328
North Dakota	4,413	3,399	19,740	12,777	258,072	175,877
Ohio	166,664	100,985	310,376	200,272	6,644,895	4,702,382
Oklahoma	95,017	135,761	123,596	170,719	2,213,685	1,237,440
Oregon	56,798	18,857	71,357	35,296	926,874	522,764
Pennsylvania	227,854	196,920	427,501	353,107	7,922,885	4,703,269
Porto Rico	4,575	1,725	5,645	9,613	67,675	55,253
Rhode Island	14,861	10,927	31,523	20,577	569,817	305,267
South Carolina	56,714	23,202	55,309	26,081	2,250,646	367,581
South Dakota	11,565	11,375	27,070	17,808	637,023	333,934
Tennessee	53,689	112,589	98,855	136,572	1,396,425	1,165,781
Texas	384,174	365,234	403,806	354,811	5,684,691	3,959,368
Utah	10,972	10,608	15,997	16,320	311,212	165,558
Vermont	2,379	2,111	15,312	10,431	312,492	259,355
Virginia	64,153	80,244	86,856	91,407	1,596,041	903,508
Washington	83,502	40,943	163,168	67,365	2,086,795	1,288,582
West Virginia	44,309	38,733	65,620	59,766	1,421,369	858,436
Wisconsin	64,183	43,856	176,417	90,703	3,977,652	2,950,491
Wyoming	3,579	4,840	7,547	5,608	136,273	83,010
Unspecified	8,858	5,514	24,551	11,306	235,182	99,437
	3,947,380	3,422,341	6,514,855	4,866,087	126,751,835	80,233,953
Foreign countries	25,620	87,659	21,145	82,193	398,699	345,047
Total shipped from cement plants	3,973,000	3,510,000	6,536,000	4,949,000	127,150,534	80,579,000

a Includes estimated distribution of shipments from 3 mills in March and April, 1932 and March, 1933; from 4 mills in April, 1933.
b Final figures.
c Compiled from monthly reports of the producers; includes estimated distribution of shipments from 2 to 4 mills each month, and some revisions.

RATIO (PER CENT.) OF PRODUCTION TO CAPACITY (*164 plants*)

	April		March	February	January
	1932	1933	1933	1933	1932
The month	24.8	18.9	16.1	13.4	12.9
The 12 months ended	41.7	26.2	26.7	27.1	27.6

PRODUCTION AND STOCKS OF CLINKER BY MONTHS, IN 1932 AND 1933 (*thousands of barrels*)

Month	Production		Stocks End of Month		Month	Production		Stocks End of Month	
	1932	1933	1932	1933		1932	1933	1932	1933
January	6,107	3,036	8,184	6,092	July	6,613		7,889	
February	5,176	3,110	9,375	6,422	August	7,078		7,175	
March	5,443	4,147	10,025	*a* 6,890	September	7,703		6,708	
April	5,924	4,520	10,511	7,230	October	7,259		6,093	
May	6,273		9,922		November	6,290		5,938	
June	6,803		8,877		December	4,335		5,995	

a Revised.

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1932 AND 1933 (*thousands of barrels*)

Month	Production		Shipments		Stocks at End of Month	
	1932	1933	1932	1933	1932	1933
January	5,026	2,958	3,393	2,502	25,778	20,624
February	3,971	2,777	3,118	2,278	26,657	21,125
March	4,847	3,684	3,973	3,510	27,545	21,298
April	5,478	4,183	6,536	4,949	26,496	20,532
May	6,913	.....	8,020	.....	25,394	.....
June	7,921	.....	9,264	.....	24,043	.....
July	7,659	.....	9,218	.....	22,512	.....
August	7,835	.....	10,968	.....	19,398	.....
September	8,210	.....	9,729	.....	17,878	.....
October	7,939	.....	8,743	.....	17,084	.....
November	6,462	.....	4,782	.....	18,788	.....
December	4,248	.....	2,835	.....	20,205	.....
Totals	76,509	.....	80,579	.....	.....	.....

PRODUCTION AND STOCKS OF CLINKER, BY DISTRICTS, in APRIL, 1932 and 1933 (*thousands of barrels*)

District	Production		Stocks at end of Month	
	1932	1933	1932	1933
Eastern Pa., N. J., and Md.	1,392	1,119	1,149	1,010
New York and Maine	745	144	1,005	373
Ohio, Western Pa., and W. Va.	243	313	1,064	688
Michigan	498	224	1,192	929
Wis., Ill., Ind., and Ky.	682	399	1,501	861
Va., Tenn., Ala., Ga., Fla., and La.	466	522	732	385
Eastern Mo., Ia., Minn., and S. Dak.	573	363	610	384
W. Mo., Neb., Kan., Okla., and Ark.	107	360	829	523
Texas	409	379	295	170
Colo., Mont., Utah, Wyo., and Idaho	77	61	134	300
California	554	636	1,720	1,440
Oreg. and Wash.	178	.....	280	167
Totals	5,924	4,520	10,511	7,230

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN APRIL, 1932 AND 1933, AND STOCKS IN MARCH, 1933 (*thousands of barrels*)

District	April						Stocks at End of March *a*
	Production		Shipments		Stocks at End of Month		
	1932	1933	1932	1933	1932	1933	1933
Eastern Pa., N. J., and Md.	1,497	1,027	1,720	1,058	6,014	3,612	3,643
New York and Maine	537	195	522	271	1,924	1,514	1,590
Ohio, Western Pa., and W. Va.	309	218	520	417	3,190	2,675	2,874
Michigan	290	161	259	149	2,045	1,600	1,589
Wis., Ill., Ind., and Ky.	564	276	611	386	3,772	2,635	2,745
Va., Tenn., Ala., Ga., Fla., and La.	484	493	537	589	1,549	1,571	1,667
Eastern Mo., Ia., Minn., and S. Dak.	420	389	591	403	3,636	2,889	2,903
W. Mo., Neb., Kan., Okla., and Ark.	83	386	505	548	1,484	1,432	1,595
Texas	397	372	368	347	800	666	640
Colo., Mont., Utah, Wyo., and Idaho	93	114	126	134	398	351	371
California	535	500	554	547	1,072	1,135	1,182
Oreg. and Wash.	269	52	223	100	612	452	499
Totals	5,478	4,183	6,536	4,949	26,496	20,532	21,298

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1932 AND 1933

Month	Exports				Imports			
	1932		1933		1932		1933	
	Barrels	Value	Barrels	Value	Barrels	Value	Barrels	Value
January	36,704	$82,984	26,790	$50,281	14,375	$16,648	59,380	$45,851
February	12,889	39,350	26,643	57,860	83,707	69,197	65,251	50,151
March	39,105	81,856	84,139	178,743	19,173	17,215	14,143	10,615
April	30,123	69,451	.....	.....	59,392	40,999	.....	.....
May	31,634	71,048	.....	.....	9,223	7,358	.....	.....
June	33,134	72,084	.....	.....	19,962	14,715	.....	.....
July	18,972	54,814	.....	.....	31,519	24,904	.....	.....
August	25,110	48,961	.....	.....	76,407	55,710	.....	.....
September	35,270	63,018	.....	.....	68,220	49,754	.....	.....
October	28,756	52,922	.....	.....	59,769	40,380	.....	.....
November	57,811	98,187	.....	.....	11,692	7,414	.....	.....
December	25,073	67,530	.....	.....	9,057	6,739	.....	.....
Totals	374,581	$802,205	.....	.....	462,496	$351,033	.....	.....

a Revised

New P. C. A. Booklet on Cement-Bound Macadam

The Portland Cement Assn., 33 West Grand Ave., Chicago, Ill., has issued a 16-page illustrated booklet on cement-bound macadam. This booklet gives the history of this type of pavement in this country and in Europe and describes the revival of interest and the application of modern methods and equipment to the recent construction of such pavements. Recommended design and specifications are also included.

Correction

In a description of the Bendelari diaphragm jig, published in the April, 1933, issue of PIT AND QUARRY, an illustration of this jig was used in an inverted position. This jig, which successfully removes shale, lignite, coal, soft stone, etc., from gravel, was developed by F. N. Bendelari, president of the Consolidated Lead & Zinc Co., Joplin, Mo.

P. C. A. Publishes Book on Highway Economics

The Portland Cement Assn., 33 West Grand Ave., Chicago, Ill., has published a 20-page booklet entitled *Economics of Highway Improvement*. This booklet is a technical treatise of the subject prepared in such a way that highway engineers can apply it to their own traffic, construction and maintenance problems and quickly determine when and where to build roads. It summarizes the work of the Highway Research Board in developing the tests and details needed to place road building on a sound business basis. The essential findings of the Committee on the Economics of Highway Improvement are also assembled and applied to a practical solution of road-building problems.

Producer Fined for Labor-Law Violation

The superintendent and the blasting foreman of one of the plants of a large New York crushed-stone producer paid a total of $50 in fines recently in a local court for storing high explosives under unsafe conditions. The arrest was made by a state policeman on a charge of labor-law violation. Over 2,000 lb. of dynamite and 500 lb. of blasting caps were found stored in a wooden magazine which was unlocked and in need of repairs.

Los Angeles Producer Wins Suit Against City

Mayor John C. Porter of Los Angeles, Cal., recently approved the payment of $50,000 to the Los Angeles Rock & Gravel Co. in full settlement of a $675,000 claim for damages, filed by the company after it was forced by the city to abandon a quarry in the Arroyo Seco.

Traffic News and Comment

Recent I. C. C. Decisions

Amiesite.—The commission has found the rates on crushed stone coated with oil, tar or asphaltum from Pittsburgh and Casparis, Pa., and Cheektowaga, N. Y., to destinations in Ohio, Pennsylvania, New York, West Virginia and Maryland on and west of an imaginary line drawn north and south through Cumberland, Md., and Cresson, Pa., are, and for the future will be, unreasonable and unduly prejudicial to the extent that they exceed or may exceed the rates prescribed in Interstate Amiesite Co., *v.* A. C. & Y., 173 I. C. C. 456. A mileage scale has been prescribed to remove the unreasonableness of the present rates from Martinsburg, W. Va., to the territory noted above. In connection with the rates from Martinsburg distances are to be computed over the routes composed of not more than three line-haul carriers, *via* existing connections for interchange of car-load traffic, which will result in the lowest rates, taking into consideration the joint-line differential. New rates are to be made effective on or before Aug. 1, and emergency charges may be added. Representative rates on the prescribed scale to apply from Martinsburg are:

Miles	Single	Joint
80	$1.13	$1.28
100	1.23	1.37
125	1.33	1.46
150	1.43	1.55
175	1.53	1.64
200	1.61	1.71
225	1.68	1.77
250	1.75	1.83

I. C. C. Docket No. 25,028, Amiesite Corp., *et al. v.* A. C. & Y., *et al.*, and No. 25,028, The Interstate Amiesite Co., *v.* Same.

Cement Flue Dust.—In response to Fourth Section Application No. 15,035, the carriers have been granted authority to establish and maintain rates on cement-flue dust from Hagerstown and Security, Md., to destinations in North Carolina and Virginia without observing the long-and-short-haul clause of the fourth section, subject to the 50-per cent. circuity limitation.—F. S. O. No. 11,247.

Crushed Stone.—Rates applying on crushed stone from points in North Carolina to interstate destinations in North Carolina, Virginia and South Carolina, and from Tennessee points to destinations in North Carolina, except rates applying *via* the Atlantic and Yadkin, have been found unreasonable to the extent that they exceed or may exceed the single-line scale prescribed in 122 I. C. C. 133, plus the authorized emergency charges. Reparation has been awarded complainant and intervener. New rates are to be made effective on or before July 29.—I. C. C. Docket No. 25,245, Hiddenite Granite Co. *v.* Yadkin *et al.*

Finding the rate on crushed stone from Greenfield, Mass., to Petersburg, N. Y., not unreasonable, the commission has dismissed the complaint in I. C. C. Docket No. 24,830, Kelleher Corp. *v.* B. & M. *et al.*

Lime.—Rates on hydrated lime from Speedway (Indianapolis), Ind., have been found unreasonable to the extent that they exceed the following: to Louisville, Ky., 12 c.; Dayton, O., 12 c.; Columbus, O., Chicago, Ill., Joliet, Ill., 14 c.; Jackson, Mich., 14½ c.; E. St. Louis, Ill., 15½ c.; Detroit, Mich., 16 c.; and Flint, Mich., 17 c.; plus authorized emergency charges. Reparation has been awarded.—I. C. C. Docket No. 25,114, Lime Products Corp. *v.* B. & O. *et al.*

Sand.—The interstate rates on sand from Polk, Pa., to Kendall and Coraopolis, Pa., were found unreasonable prior to Oct. 14, 1930, to the extent that they exceeded $1.60 per ton in I. C. C. Docket No. 24,144, Continental Roll & Steel Foundry Co. *v.* N. Y. C. *et al.*

Finding the rates on sand from Polk, Pa., to Erie, Glassport, and Homestead, Pa., *via* interstate routes not unreasonable, the commission has dismissed the complaint in I. C. C. Docket No. 24,291, National-Erie Co. *v.* N. Y. C.

Reparation of $21.22 has been awarded on a finding of an unreasonable charge on a car of silica sand in bags. The rate charged was $4.32 per ton on 90 per cent. of the marked capacity of the 100,000-lb. car used. This was found unreasonable to the extent that it exceeded charges based on 90 per cent. of 80,000 lb.—I. C. C. Docket No. 25,161, Sanistone Products Co. *v.* Pennsylvania.

Sand and Gravel.—The Buckland Scale, prescribed in 139 I. C. C. 88, has been found to be the reasonable measure of rates on sand and gravel from Elizabethtown and Siam, Tenn., to destinations in Virginia, and reparation has been awarded on shipments moving from Elizabethtown on rates higher than the scale. Intrastate rates from Petersburg, Va., which are lower than the scale, are unduly prejudicial to the complainants. New rates are to be made effective on or before July 29.—I. C. C. Docket No. 24,840, East Tennessee Sand & Gravel Co. *v.* Southern *et al.*

Talc.—Reparation has been awarded on finding that the rate on talc from Natural Bridge and Emeryville, N. Y., to Richmond, Va., was and is unreasonable to the extent that it exceeded or may exceed 27½ c., car-load minimum weight 60,000 lb., and the new rate is ordered to become effective on or before Aug. 4, in I. C. C. Docket No. 25,302, Standard Paper Mfg. Co. Inc. *v.* B. & O. *et al.*

Examiners' Reports

Agricultural and Ground Limestone.—Examiner J. Edgar Smith proposes that the commission prescribe a mileage scale to be used in making rates on limestone derivatives within eastern trunk-line territory, and has recommended such a scale which is shown in Appendix C to his report. The rates at various points on this scale are:

Miles	Single	Joint
20	$0.65	$0.75
50	.95	1.05
100	1.30	1.35
200	1.80	1.80
300	2.30	2.30
400	2.80	2.80
500	3.30	3.30

This scale is to apply between all points in eastern trunk-line territory east of a line connecting Olean, N. Y., Cresson, Pa., and Cumberland, Md., to Hudson River and the Atlantic seaboard south of New York. To destinations east of Hudson River and in Long Island this basic scale is to be increased 15 per cent. The basic scale will apply on ground limestone, car-load minimum weight 60,000 lb., in box-cars. Rates for the future on agricultural lime, either quick or hydrated, car-load minimum weight 40,000 lb., should be made by using the basic scale increased by 50 per cent. The examiner said that the use of the scale would eliminate any undue preference or prejudice that might exist, and would also eliminate discriminations between interstate and intrastate rates in New York as this scale was on the level of the rates adopted by most of the carriers in New York state.—I. C. C. Docket No. 25,220, American Lime & Stone Co. *et al v.* Pennsylvania *et al;* No. 24,757, Limestone Products Corp. of America *v.* L. & H. R. *et al.;* No. 24,432, Washington Building Lime Co. *et al. v.* A. C. R. R. *et al.;* No. 24,432 Sub. 1, Same *v.* B. & E.; No. 24,432 Sub. 2, Warner Co. *et al. v.* A. C. R. R. *et al.*

Cement.—Examiner C. K. Glover proposes that fourth-section relief be granted in the establishment and maintenance of rates on cement between points in the southwest and western trunk-line territories, permitting departure from the long-and-short-haul clause, subject to the 70, 50 and 33 1/3 per cent. circuity limitations. He recommends a modification of the prior findings in affected cases to conform to his proposal. Previous decisions affected would be: Iola Cement Mills Traffic Assn. *v.* A. W. 87 I. C. C. 451; Oklahoma Portland Cement Co. *v.* D. & R. G. W. 128 I. C. C. 63; and Iola

Cement Mills Traffic Assn. *v.* A. & V., 144 I. C. C. 585 and 148 I. C. C. 122. He recommends that in lieu of a specific routing a rule showing the rates and the maximum distance for routing, similar to the rule approved for the same purpose in Western Cement Rates, 132 I. C. C. 273, be permitted.—I. C. C. F. S. A. No. 14,138.

Crushed Stone.—Examiner H. C. Lawton recommends that relief be granted from the long-and-short-haul clause of the fourth section in connection with the rates on crushed stone or crushed marble (terrazzo aggregate), when such rates are constructed on the basis prescribed or approved in the Stone, Marble and Slate Case, 183 I. C. C. 611, between points in southern territory on one hand and points in trunk-line and New England territories on the other hand, using the same routes over which rates are made as directed in the Southern Class Rate Investigation, but the rates so constructed must not exceed the lowest combination of rates subject to the interstate commerce act.—I. C. C. F. S. A. 14,794 and 14,964.

Lime.—Examiner T. Naftalin proposes that the commission find the rate charged on lime from Capon Road (Oranda), Va., to McKeesport, Va., be found applicable and the complaint dismissed in I. C. C. Docket No. 25,346, Pittsburgh Generator Co., Inc. *v.* B. & O. *et al.*

Sand and Gravel.—Examiner Leo J. Flynn recommends that the commission find the rates on sand and gravel from Hanover, Kan., to Pickrell, Cortland and Princeton, Neb., not unreasonable, unduly prejudicial or unjustly discriminatory against interstate commerce, and dismiss the complaint in I. C. C. Docket No. 25,558, Washington County Sand and Gravel Co. *v.* U. P. *et al.*

New Complaints Filed

Reductions in Rates and Charges.—In response to various petitions the commission has instituted an investigation to determine whether and to what extent, if any, reductions in the rates and charges of carriers, may or should be required upon any commodities or any description of traffic. Among those appearing at the hearings in this investigation was W. C. Dressler, traffic manager for Oglebay, Norton & Co., Cleveland, O., shipper of fluorspar produced in Illinois and Kentucky. He pointed out that the rail rates on fluorspar had not been changed since 1923, but that transportation costs to the Mahoning Valley had been cut since 1927 by the use of barges. A statement was presented by V. P. Ahearn, secretary on the National Sand & Gravel Assn., prepared by himself and J. R. Boyd, secretary of the National Crushed Stone Assn., favoring a reduction in freight rates. Mr. Ahearn said that the competition of wayside pits was making it hard for the producers of crushed stone, sand and gravel to survive the low prices made possible by the use of forms of transportation competitive with the railroad, and that the commission would be acting in the best interests of the railroads if it ordered a substantial and nation wide reduction in rates.—I. C. C. Docket No. 26,000.

Cement.—The commission has suspended until Dec. 1 schedules in Sup. 67 and 68 to Curlett's I. C. C. No. A-306, and other tariffs of agents and individual lines proposing to cancel the rules for constructing combination rates on cement from eastern points to western destinations that would result in increased rates.—I. & S. Docket No. 3,876.

Lime and Plaster.—The commission has suspended various schedules until Dec. 1, which would result in increases by cancelling the rules for constructing combination rates on lime and plaster when shipped in mixed carloads with cement between points in western trunk-line territory.—I. & S. Docket No. 3,877.

Industrial Sand.—Following the recent decision in the industrial sand cases, the commission has been flooded with complaints seeking an award of reparation and alleging a violation of Sec. 1. Quite a number of these complaints were listed in the May issue of PIT AND QUARRY, and those that have been filed since that time containing the same general complaint and prayer are:

25,845, Sub. No. 1. Frederick L. Leckie, Cleveland, O., *v.* C. B. & Q. *et al.*

25,845, Sub. No. 2. S. S. Boyer, Fremont, O., *v.* C. B. & Q. *et al.*

25,871, Sub. No. 1. Noble & Wood Machine Co., Hoosick Falls, N. Y., *v.* Pennsylvania *et al.*

25,871, Sub. No. 2. Chemung Foundry Corp., Elmira, N. Y., *v.* Pennsylvania.

25,884, Sub. No. 4. Hajoca Corp., Philadelphia, Pa., *v.* Reading *et al.*

25,884, Sub. No. 5. Lehigh Foundries, Inc., Easton, Pa., *v.* N. Y. C. *et al.*

25,884, Sub. No. 6. Colebrookdale Iron Co., Colebrookdale, Pa., *v.* Reading *et al.*

25,867, Sub. No. 5. Campbell Foundry Co., Harrison, N. J., *v.* West Shore *et al.*

25,868, Sub. No. 2. Standard Foundry Co., Worcester, Mass., *v.* D. & H. *et al.*

25,900. National Radiator Corp., Johnstown, Pa., *v.* Wabash *et al.*

25,901. Fales & Jenks Machine Co., Pawtucket, R. I., *v.* Pennsylvania *et al.*

25,901, Sub. No. 1. Crompton & Knowles Loom Works, Worcester, Mass., *v.* N. Y. C. *et al.*

25,916. Alexander Smith & Sons Carpet Co., Yonkers, N. Y., *v.* Atlantic City R. R. *et al.*

25,917. New Brunswick Iron Works, New Brunswick, N. J., *v.* D. & H. *et al.*

25,863, Sub. No. 1. Hoover Steel Ball Co., Ann Arbor, Mich. *v.* C. B. & Q. *et al.*

25,867, Sub. No. 7. Phelps Dodge Copper Products Corp., New York, N. Y., *v.* N. Y. C. *et al.*

25,928. Abendroth Bros., Port Chester, N. Y., *v.* Pennsylvania *et al.*

25,934. Pine Hill Coal Co., Philadelphia, Pa., *v.* C. N. J. *et al.*

25,935. Herbert Mfg. Co., Franklin, N. H., *v.* B. & M.

25,884, Sub. No. 7. Cochrane Corp., Philadelphia, Pa., *v.* C. N. J. *et al.*

25,955. Richmond Radiator Co., Inc., New York, N. Y., *v.* G. T. W. *et al.*

25,972. The H. B. Smith Co., Westfield, Mass., *v.* C. B. & Q. *et al.*

Sand.—Alleging violation of Sec. 1 and 3 with other shippers in the Sandusky group preferred, the complainant is asking for reparation and a new rate not exceeding $2.14 per net ton in place of the present rate of $2.74, on molding sand from Shinrock, O., to South Bend, Ind.—I. C. C. Docket No. 25,961, Keener Sand & Clay Co., Columbus, O., *v.* N. Y. C. & St. L.

New rates and reparation are sought in connection with the movement of sand from Williamstown Jct., N. J., to Delawanna, N. J., on the complaint that the rates violate Sec. 1, 2 and 3, to the extent that they exceed the scale prescribed in Docket No. 22,907.—I. C. C. Docket No. 25,971, Kelley Plasterboard Co., Delawanna, N. J., *v.* C. N. J. *et al.*

Sand and Gravel.—New rates and reparation are sought on an allegation of unreasonable rates and charges on sand and gravel from Plattemouth and Oreapolis, Neb., to Afton and Thayer, Ia.—I. C. C. Docket No. 25,922, Capital Construction Co., Des Moines, Ia., *v.* C. B. & Q.

Cement.—Reparation is sought in connection with the movement of cement to points in Arkansas, Louisiana and Missouri, on an allegation of violation of Sec. 1 and 3 with shippers at Ada, Okla.; Eagle Ford, Harry's and Houston, Tex.; Hannibal, Mo.; Birmingham, N. Birmingham, Spocari, Leeds and Ragland, Ala.; Chattanooga and Nashville, Tenn.; Marquette, Mo.; Kosmosdale, Ky., and in the Kansas Gas Belt, preferred.—I. C. C. Docket No. 25,953, Louisville Cement Co., Louisville, Ky., *v.* Pennsylvania *et al.*

Rate-Committee Dockets

New England Freight Assn.

Cement.—Carriers propose to reduce the rates on cement from Bridgeport, Conn., to all New Haven Stations to a mileage-scale basis, representative rates of which are shown below, in Docket No. 29,392.

Miles	Rate
1 to 5	$0.05
51 to 60	.10
81 to 95	.11½
126 to 140	.13
186 to 200	.15

Lime.—Carriers propose to reduce the car-load minimum weight on lime from Maine Central stations to destinations on the New Haven, Harlem River, New York City stations and vicinity, from 40,000 lb., to 30,000 lb.—Docket No. 29,173.

Terrazzo Aggregate.—Carriers propose to revise the rates on crushed stone and crushed marble terrazzo aggregate from Brandon and Middlebury, Vt., to New England, Trunk Line and C. F. A. territories to 17 per cent. of the first-class.—Docket No. 29,219.

Trunk Line Assn.

Amiesite.—A line of rates on crushed stone coated with oil, tar or asphaltum, from Snow Flake, W. Va., is proposed by shippers. A statement of these

proposed rates will be furnished on request.—Docket No. 30,763.

Dolomite.—Carriers propose to change the description of raw or crude dolomite and fluxing stone to read as follows: "Stone, furnace or foundry melting and/or refractory, unburned, in bulk.[1]" For application within trunk-line territory and from that territory.—Docket No. M-3,221.

Lime.—Carriers propose to reduce the car-load minimum weight on recarbonated waste lime (whiting substitute) and precipitated lime from 50,000 to 40,000 lb., from and to all trunk-line points.—Docket No. 30,-791 Sup. 1.

Central Freight Assn.

Agricultural Limestone.—Carriers propose to amend the commodity description of agricultural limestone published in agency and individual lines' tariffs, in connection with rates between points in C. F. A. territory to points east of the western terminal of eastern trunk lines, to read as follows: "Limestone, agricultural (raw, not burned or otherwise treated, crushed, ground or pulverized)."—Docket No. 35,807.

Cement.—Shippers propose a reduction in the rate on cement, car-load minimum weight 50,000 lb., from Cleveland, O., to Marblehead, O., from 10½ c. to 9 c. and from Toledo, O., to Marblehead from 9½ c. to 8 c.—Docket No. 35,470.

Shippers request that agency and individual lines' tariffs publishing rules governing stop-off privileges for the purpose of partial unloading or to complete loading at points in C. F. A. territory be amended by providing that said rules will not be applicable in connection with shipments of cement.—Docket No. 35,674.

Crushed Stone.—Shippers propose that rates be established on crushed stone and crushed-stone screenings from East Brady, Pa., to destinations in the state of Pennsylvania west of a line drawn from Sand Patch, Pa., on the B. & O. to Cresson, Pa., on the P. R. R., thence due north to the Pennsylvania-N. Y., state line on the basis of the following mileage scale.—Docket No. 35,512.

Miles	Single	Joint
20	$0.60	$0.80
40	.70	.90
60	.80	1.00
80	.90	1.10
100	1.00	1.20
125	1.10	1.30
150	1.20	1.40
175	1.30	1.50
200	1.40	1.60

Fluorspar.—An increase in the rate on fluorspar from Cincinnati, O., to Taylorstown and Washington, Pa., from 18½ c. to 19 c. is proposed by carriers.—Docket No. 35,583.

Lime.—Shippers propose the following reduced rates to apply on lime, car-load minimum weight 36,000 lb., from Martin, Genoa and Luckey, O. to stations in Ontario. To Brantford, 17½ c.; Chatham, 15½ c.; Essex, 13 c.; Hamilton, 17½ c.; London, 16 c.; Montreal, 30½ c.; Oakville, 18½ c.; Port Hope, 25½ c.; Quebec, 36 c.; Sarnia, 16 c.; Tecumseh, 13 c.; Toronto, 18½ c.; Wallacebury, 16 c.; Windsor, 13 c.; Welland, 18½ c.—Docket No. 35,494.

Shippers propose the establishment of a rate on hydrated finishing lime, fibered or unfibered, car-load minimum weight 50,000 lb., from Gibsonburg, O., to Washington, D. C., of 17 c., to alternate with the present rate of 22 c. on a car-load minimum weight of 30,000 lb.—Docket No. 35,609.

Stone.—Carriers propose to reduce the rate on waste stone[1] from the Bedford-Bloomington district to Evansville, Ind., from $1.03 to 90 c. per ton.

Illinois Freight Assn.

Crushed Stone, Sand and Gravel.—It is proposed to revise the rates on crushed stone, sand and gravel from Pekin and Lincoln, Ill., to Pawnee, Kincaid, Taylorville and Compro, Ill., from various to 88 c. per ton, and from Joliet, Ill., to the above stations, from $1.01 to $1.13 per ton.—Docket No. 7,273.

Western Trunk Line Committee

Ground Limestone.—Shippers propose the provision of an exception to W. T. L. Tariff 207-B authorizing application of 1½ times Class E, on ground limestone, less than car-load, in cartons, in barrels or boxes, or in bulk in bags, barrels or boxes, between points in W. T. L. territory. Fourth-class rates now apply.—Docket No. 5,338-B.

Southern Freight Assn.

Asbestos Sand.—Carriers propose to revise the present rates on asbestos sand, as published in Item 504 of Sup. 60 to Agent Curlett's I. C. C. A-291, from Hyde Park, Vt., to Atlanta, Augusta, Columbus, Macon and Thomasville, Ga., Birmingham and Montgomery, Ala., Chattanooga, Memphis and Knoxville, Tenn., and Spartansburg, S. C., to a basis the same as that from Asbestos, Que. (1 c. over Danville, Que.). A statement of present and proposed rates will be furnished on request.—Docket No. 1,367.

Cement, Lime and Plaster.—Carriers suggest that rates on lime, cement and plaster in mixed car-loads, or in mixed car-loads with other articles, except as provided in notes "A" and "B" of Agent Dulaney's Exceptions to Southern Classification, be cancelled.—Docket No. 1,345.

Feldspar.—Shippers propose the establishment of the following reduced rates on feldspar, car-load minimum weight 50,000 lb., to Logan and Lancaster, O. From Erwin, Tenn., $4.60; Minpro, Spruce Pine and Tocane, N. C., $4.72 and from Bowditch and Cane Branch, N. C., $4.96 per net ton.—Docket No. 1,188.

Fluorspar.—Shippers propose the establishment of grinding-in-transit privileges on fluorspar at Kosmosdale, Ky., originating at Marion or Mexico, Ky., destined to points north and east of Louisville, Ky., applying the through rate from origin to destination plus a transit charge of 60 c. per net ton.—Docket No. 1,418.

Mica.—The following rates per 100 lb. are proposed to apply on mica, scrap or waste, crude, car-load minimum weight 60,000 lb.; from Balsam, N. C., to Rutherford, N. J., 31 c.; and to Forest Park, Ill., 33 c.—Docket No. 1,430.

Southwestern Freight Bureau

Lime.—Shippers propose a rate on lime, car-load minimum weight 30,000 lb., from Mosher and Ste. Genevieve, Mo., to Huron, S. D., of 31½ c.—Docket No. 739.

Shippers propose the following rates on lime, car-load minimum weight 30,-000 lb., to Rock Port, Mo.: From Springfield, Mo., and group, 19½ c.; Johnsons, Ark., 21 c.; Ste. Genevieve and Mosher, Mo., 22½ c.—Docket No. 901.

Texas-Louisiana Tariff Bureau

Cement.—Retail dealers propose that the present minimum weight on cement be reduced to 34,000 lb., or 90 bbl. of cement. Retail dealers say that the present minimum weight on cement is excessive to inducement to move car-lot shipments by railroads, and in the hands of small retail yards is wasteful and therefore economically wrong.—Docket No. 8,974-TX.

Crushed Stone.—Carriers propose the extension of the scale applying on crushed stone and related articles shown in Item 2, 862, of T. L. T. 2-L, beyond 800 mi. as follows in Docket No. 7,034-4:

Miles	Single	Joint
830	$3.60	$3.60
860	3.70	3.70
890	3.80	3.80
920	3.90	3.90
950	4.00	4.00
980	4.10	4.10
1,000	4.15	4.15

Transcontinental Freight Bureau

Feldspar.—Shippers request a rate of 40 c., car-load minimum weight 100,000 lb., from Group J, Item 2,553, in Tariff 1-M.—Docket No. 15,002.

Lime.—Shippers request the inclusion of carbonate of lime in Item 3,815 of Tariffs 1-M and 4-J.—Docket No. 15,116.

Pumice.—Shippers request the establishment of a rate on pumice, car-load minimum weight 50,000 lb., from via Gulf Ports to New York piers of Morgan Line in Tariff 3-F.—Docket No. 15,127.

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[1] The car-load minimum weight will be 90 per cent. of the marked capacity of the car except that when the car is loaded to its full cubical or visible capacity, the actual weight will apply.

Foreign Developments

Many Factors Influence Concrete's Workability

Writing in *Zement*, Feb. 9 and 16 (22:78-81, 93-5), Dr. Kurt Walz discusses in detail, and with a careful consideration of the literature, the factors in workability of concrete. The factors that with a given handling method will produce the optimum of physical and chemical properties in the finished concrete are variously concerned with the cement (workability being increased with lowered specific gravity, increased fineness and early formation of gelatinous hydration products), the proportion of water, the aggregates (both shape and gradation having important effects on workability), admixtures (particularly inert powders, and needed if the concrete is low in cement or fine aggregates), and various external influences (as time of mixing and temperature).

New Device Records Hardening of Mortar

A German manufacturer has brought out a new apparatus for automatically recording the hardening of mortar. It is based on the principle of the Vicat needle. A small electric motor lowers the needle of 1-sq.mm. section and 300-g. load, automatically and at regular time intervals, on the mortar. At the instant the needle penetrates the mortar, a pencil makes a horizontal mark on a sheet of paper on a drum, so that at the end of hardening the sheet contains a continuous record of the penetration as a function of time. The pan of mortar is rotated so that the needle always strikes fresh mortar.—*Zement*, 22: 118-9, Mar. 2, 1933.

How Lime Accelerates Set of Alumina Cement

In 1930 K. Koyanagi in Japan and Kühl and Ideta in Germany came independently to the conclusion that the source of the rapid setting of alumina cement when Portland cement is admixed is not any of the principal components of the cement but the lime liberated in the hydration of the silicates. Pursuing his investigations, Koyanagi reports in *Zement*, Mar. 9 (22:129-34), a chemical and microscopic study of the hydration products from the action of calcium hydrate on alumina cement and the reactions that take place.

The principal hydration process when alumina cement is mixed with ordinary water is:

$2\ (CaO.Al_2O_3) + 10.5\ H_2O = 2\ CaO.Al_2O_3.\ 7.5\ H_2O + Al_2O_3.\ 3H_2O.$

This reaction is comparatively slow. Koyanagi finds that when lime is added, the following reactions take place:

$CaO.Al_2O_3 + Ca(OH)_2 + 6.5\ H_2O = 2\ CaO.Al_2O_3.\ 7.5\ H_2O,$

$CaO.Al_2O_3 + 2\ Ca(OH)_2 + 3.8\ H_2O = 3\ CaO.Al_2O_3.\ 5.8\ H_2O.$

These proceed very rapidly and vigorously and make the cement rapid-setting.

When alumina cement is hydrated with ordinary water a very small amount of lime hydrate is produced in the first stage of the decomposition of the calcium silicate. But as the quantity of calcium silicate is low the lime concentration is low and the first of the reactions involving lime takes place very slowly. When Portland cement is mixed with alumina cement, the concentration of lime becomes great enough to accelerate the set of the cement.

Admixture of Magnesite Found to Weaken Mortar

There is no object in deliberately admixing burned magnesite with cement, especially in view of its high price, but sometimes a little magnesite can get mixed with the cement, by accident, on the job. A series of strength tests to see whether such admixture is harmful shows that the presence of magnesite reduces the strengths of the concrete mortars in practically any quantity and at all periods.—Dr. R. Grün in *Tonindustrie-Zeitung*, 57:226, Mar. 6, 1933.

Studies Coordination of Aluminate Salts

At the meeting of the Friends of the Kaiser Wilhelm Institute for Silicate Research in Dahlem (Berlin) last Nov. 8, Dr. L. Forsen reported on a series of investigations in the Lojo Kalkverk laboratory (Finland) and, at the Abo Academy, on the constitution of the calcium aluminates and their double salts in the Werner coordination system. The report was summarized in *Tonindustrie-Zeitung*, Dec. 12, 1932 (56:1228-9), and is printed in full in *Zement*, Feb. 9, 16 and 23 (22:73-7, 87-91, 100-2).

Compounds produced and studied were principally:

$2CaO.\ Al_2O_3.\ 7H_2O\ (5H_2O)$
$3CaO.\ Al_2O_3.\ 6H_2O\ (6H_2O)$
$3CaO.\ Al_2O_3.\ 12H_2O\ (6H_2O)$
$3CaO.\ Al_2O_3.\ 18H_2O\ (6H_2O)$
$4CaO.\ Al_2O_3.\ 13H_2O\ (7H_2O)$
$3CaO.\ Al_2O_3.\ CaX_2.\ 10\ (6)\ H_2O$, in which X = Cl, Br, I, NO_3, ClO_3
$3CaO.\ Al_2O_3.\ CaSO_4.\ 12\ (6\frac{1}{2})\ H_2O$
$3CaO.\ Al_2O_3.\ 3CaSO_4.\ 31\frac{1}{2}\ (7\frac{1}{2})\ H_2O,$

in which the figures in parentheses represent the hydration water of anhydrides dried over P_2O_5 at 105 deg. The study also included a number of silicates: tricalcium silicate $3CaO.SiO_2$, Hillebrandite $2CaO.SiO_2.\ 1H_2O$, Afwillite $3CaO.\ 2SiO_2.\ 3H_2O$, and Plombierite $CaO.SiO_2.\ 2H_2O$.

From the data developed the reactions important in the study of cement are thus formulated: First the tricalcium aluminate is dissolved and hydrated to the hexa-hydroxo-aluminum compound:

$3CaO.Al_2O_3 + 6\ H_2O \rightarrow Ca_3\ [Al(OH)_6]_2.$

The dissolved aluminate is separated out by the calcium salt (usually gypsum) as the weakly-soluble double salt:

$Ca_3\ [Al(OH)_6]_2 + CaX_2 \rightarrow 2Ca_2\ [X]\ [Al(OH)_6].$

Of course, the quantity of retarder (gypsum) added precipitates only a part of the aluminate, but the quantity of calcium hydroxide formed later from the tricalcium silicate suffices to precipitate all the aluminate:

$Ca_3\ [Al(OH)_6]_2 + Ca(OH)_2 \rightarrow 2Ca_2\ [OH]\ [Al(OH)_6].$

The tricalcium silicate reacts, without going into solution, to liberate calcium hydroxide, at the same time forming water and swelling:

$Ca_3\ (SiO_5) + 2H_2O \rightarrow Ca(OH)_2 + Ca_2\ H_2\ (SiO_5).$

The strength of the cement paste arises from the combined effect of the amorphous silicate gel and the crystallized calcium hydroxide.

In these reactions the water coördinated with the calcium is not considered. The anhydride compounds are the most soluble and dissolve first, yielding "supersaturated" solutions. The quantities of water combined with the calcium ion have not yet been determined exactly; however, the data are sufficient to develop at least a working hypothesis.

Germans Make New Rules for Storing Explosives

In its anxiety to keep explosives from falling into the hands of disturbers, the Prussian government has issued new regulations for the storage of explosives, with requirements which cause the magazine *Steinindustrie*, Apr. 27 (28:70-1), to wonder if the government is not unduly wrought up. A particularly onerous provision is that exposed sheds for storing explosives must have double iron doors each 5 mm. thick, which, it is claimed, could only be provided at an intolerable expenditure. The magazine declares existing precautions to be ample, and points out that they were sufficient in times when political unrest was much greater than to-day.

Recent Patents

Calcining

Apparatus for continuous calcination of gypsum. Fred J. Gough, Fort Dodge, Ia., assignor to United States Gypsum Co. No. 1,905,089.

Rotary kiln for burning cement, ore, and similar materials. Lionel D. Parker, Barrow-in-Furness, England. No. 1,905,744.

Method of and apparatus for calcining gypsum. Charles R. Birdsey, Hinsdale, Ill., assignor to United States Gypsum Co. No. 1,907,717.

Cement Manufacture

Manufacture of cement. Robert E. Windecker, Painesville, O. No. 1,904,-639.

Production of cement. James A. Singmaster, Bronxville, N. Y. No. 1,904,699.

Mortar cement. Orie E. Wasson, Youngstown, O., assignor to Bessemer Cement Corp., same place. No. 1,904,-909.

Hydraulic cement. Edward W. Rice, Santa Cruz, Cal., assignor to Santa Cruz Portland Cement Co., San Francisco, Cal. No. 1,907,003.

Hydraulic cement mortar and method of compounding. Frederick C. Langenberg, Edgewater Park, and Horace S. Hunt and Herbert G. Reddick, Burlington, N. J., assignors to United States Pipe & Foundry Co., Burlington. Nos. 1,908,636 and 1,908,-637.

Water-repellant (cementitious) composition and method of making. Hiram S. Lukens, Philadelphia, Pa. No. 1,906,276.

Crushing

Crushing machinery. Charles A. Jamison, Philadelphia, Pa., assignor to Pennsylvania Crusher Co. No. 1,908,-021.

Drilling

Mining-drill mounting. Louis J. Fellay, Peoria, Ill., assignor to Dooley Bros., same place. No. 1,904,655 and No. 1,904,656.

Mining drill. Louis J. Fellay, Peoria, Ill., assignor to Dooley Bros. No. 1,904,657.

Safety device for rock drills. Earl B. Lear, Phillipsburg, N. J., assignor to Ingersoll-Rand Co. No. 1,905,474.

Excavating

Self-locking boom-hoist (for excavators). George T. Ronk, Grand Rapids, Ia. No. 1,904,930.

Fluid-operated dipper-trip. George G. Morin, Holyoke, Mass. No. 1,905,-183.

Excavator. Frederick O. Snow, Jr., Winchester, Mass., assignor to Mead-Morrison Mfg. Co., East Boston, Mass. No. 1,905,191.

Hopper crane of the movable and traveling type. Fernand Boyer, St. Quentin, France. No. 1,905,434.

Grab. Ejgil V. P. Dyggve, Copenhagen, Denmark. No. 1,905,450.

Shoveling machine. John S. Finlay and Edwin B. Royle, Eureka, Utah. No. 1,906,001.

Back-digging shovel. Mitchell L. Fyske, South Milwaukee, Wis., assignor to Bucyrus-Erie Co. No. 1,906,-746.

FOREIGN

Blasting and Explosives

Means for effecting discharge of explosive charges such as those of blasting cartridges. D. Hodge and Cardox (Great Britain), Ltd. British 386,311 and 386,688.

Blasting cartridges. D. Hodge and Cardox (Great Britain), Ltd. British 387,068.

Cement and Concrete

Preparation of hydraulic materials as base for mortars and concretes. "Straba" Strassenbaubedarfs Akt.-Ges. French 736,461.

Production of aluminous cement. Metallgesellschaft Akt.-Ges. French 737,345.

Preparation of cement raw materials. F. L. Smidth & Co. A. S. French 737,833.

Colored Portland cements and concretes. Cement Marketing Co., Ltd. French 738,383.

Improving the qualities of cements. L. C. F. Pechin, Bois-Colombes, Seine. French 738,437.

Process and apparatus for preparation of cement clinker. H. I. Lee. French 738,461.

Preparation of light-weight concrete. Philipp Holzmann Akt.-Ges. French 739,384.

Device for registering the set of plasters, cements, hydraulic binders and others. L. C. R. Lequeux. French 739,707.

Process for giving cement products the appearance of marble. L. Lombardi. French 739,858.

Surface treatment of plasters and cements. Imperial Chemical Industries, Ltd. French 739,884.

Manufacture of a cement with high early tensile strength. Hoesch-Koln Neuessen Akt.-Ges. für Bergbau und Huttenbetrieb. French 740,861.

Improvements in high-alumina cement materials. N. V. S. Knibbs. French 741,682.

Improving strength and imperviousness of cement, mortar, plaster and concrete. K. Winkler & Co. Ges. British 387,429.

Crushing and Grinding

Jaw crusher. Fried. Krupp Akt.-Ges., Magdeburg-Buckau. German 560,079.

Ring-roller mill (edge runner). Emil Schellberg and Peter Weyer, Bergisch-Gladbach. German 560,080.

Roll crushers. Paul v. Knüpffer, Berlin-Charlottenburg. German 560,-284, 560,28 and 560,286; additions to 524,601.

Tube mill. Dr. Bruno Faber, Brunswick. German 560,083.

Hammer-type crusher. Schnellpressenfabrik Akt.-Ges. Heidelberg, Heidelberg. German 560,082.

Device for regulating discharge of material from mill. Chauffe et Combustion Soc. Anon., Brussels, Belgium. German 560,569.

Compound mill. Fried. Krupp Grusonwerk Akt.-Ges., Magdeburg-Buckau. German 560,499.

Tube mill. Prager Eisen-Industrie-Gesellschaft, Prague, and Rudolf Bauckmann, Libcici, Czechoslovakia. German 560,745.

Mill designed to eliminate electrostatic charges. Fried. Krupp Grusonwerk Akt.-Ges., Magdeburg-Buckau. German 560,412.

Lugged roller crusher. Josef Otto, Cologne-Lindenthal. German 560,922.

Centrifugal mill. Julius Kratz, Dortmund. German 560,743.

Tube mill. Richard Mühlhäuser, Cologne. German 562,457.

Hammer mill, particularly for fuel. Allgemeine Elektricitäts-Gesellschaft, Berlin. German 563,233.

Grinding mills. Vickers-Armstrongs, Ltd., and L. D. Parker. British 387,-407, 387,411 and 387,412.

Drilling

Drill-sharpening machines. J. Rule and Holman Bros., Ltd. British 387,-349.

Rock drills. W. W. Triggs (Ingersoll-Rand Co.). British 387,605.

Rock drill. Wilfred J. Carroll, Ross & O'Neill, Louis McClure and Henry Crick, all of Timmins, Ont. Canadian 330,086.

Drying

Rotary dryer with device for cooling the material before its discharge. Büttner-Werke Akt.-Ges., Uerdingen am Rhein. German 559,998.

Rotary dryer with several concentric cylinders. Demag Akt.-Ges., Duisburg. German 562,707.

Rotary dryer with parallel and counter current. Büttner-Werke Akt.-Ges., Uerdingen am Rhein. German 563,366.

Baffle and dust-removing apparatus for dryers, coolers and calcining trommels. Fritz Haas, Lennep, Rhineland. German 559,136.

Tapping device for removing deposits from inner walls of dryers and kilns. Büttner-Werke Akt.-Ges., Uerdingen am Rhein. German 562,973.

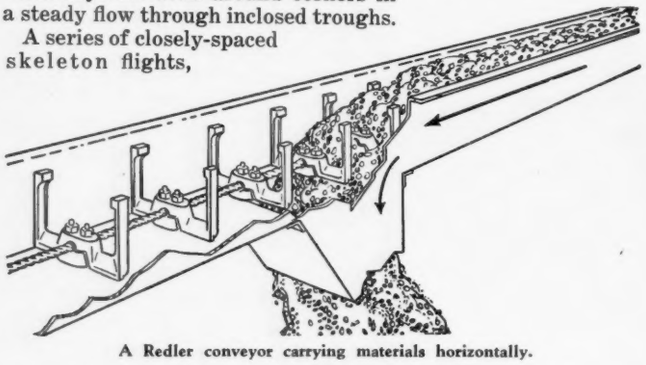
PIT AND QUARRY *will furnish, at its actual cost, a copy of any patent cited here. A charge of ten cents per copy is made by the U. S. Patent Office, Washington, D. C., and readers may procure a copy directly by addressing the Commissioner of Patents, with payment for copies requested. Postage stamps are not accepted by the Patent Office. We will endeavor to obtain copies of foreign patents for our readers but we cannot give assurance in every case for the reason that copies of such patents are not printed for distribution as liberally as are the American copies, nor is there a fixed charge per copy.*

New Machinery and Supplies

Bulk Material Conveyor Also Used as Elevator

The Redler Conveyor Co., New York City, has licensed the Stephens-Adamson Mfg. Co., Aurora, Ill., to manufacture a type of conveyor said to be new to this country. It is a "continuous flow" cable conveyor which is claimed to carry bulk materials horizontally, vertically and even around corners in a steady flow through inclosed troughs.

A series of closely-spaced skeleton flights, mounted on a flexible cable,, float completely submerged in the material in the trough and carry the material in a solid column which flows like water wherever the trough leads. A U-shaped flight is generally used but where inclines are greater than 70 deg. H-shaped flights are used. Conveyor speeds depend upon the material handled and vary from 40 to 150 ft. per min.

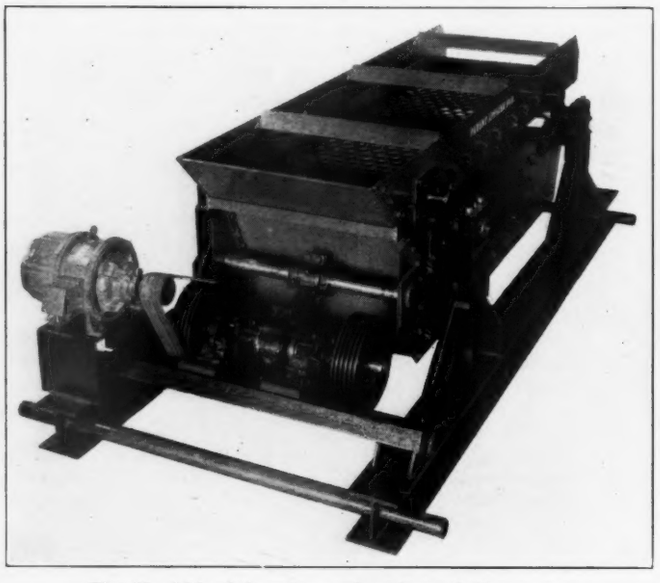


A Redler conveyor carrying materials horizontally.

This conveyor is also made in special types. The Duo Redler, which is at present made only in small sizes, carries material in two directions at one time. Measuring conveyors are also made in two types. One measures from one or more hoppers and delivers to one point. The other receives material from one point and delivers in measured quantities to a number of discharge openings. Other special-purpose applications of this system are also available.

Develop Shaking Screen With Balanced Decks

The Hendrick Manufacturing Co., Carbondale, Pa., has brought out a new short-throw shaking screen which is designed for use in screening all kinds of material. The speed of this shaker is said to be somewhat greater than is common in this type of screen. Its speed of 250 to 350 r.p.m., however, is slower than that of vibrating screens. The decks of this screen are balanced and work opposite to each other to eliminate vibration. The only rotating bearings on this screen are on the drive shaft, all others being oscillating bearings, and their movement is so small that they are equipped with oil-less bronze bushings.

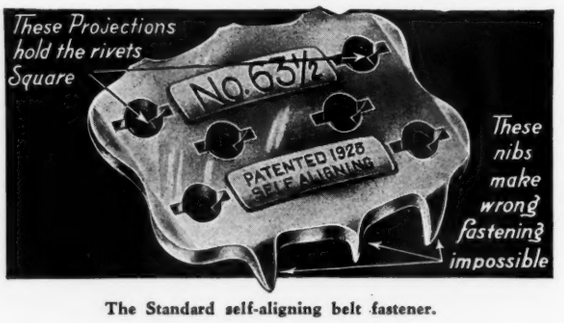


The Hendricks balanced-type short-throw shaking screen.

The screen is being made in 2, 3 or 4 decks and there is practically no limit to the size in which it can be made up. The screen works in a horizontal position, no pitch being necessary as the material is moved forward by the action of the screen. It can be mounted on a foundation or hung from overhead girders.

New Belt Fastener for Conveyor or Drive Belts

The Standard Belt Fastener Co., Unionville, Conn., manufactures a line of self-aligning rust-proof belt fasteners for transmission and conveyor belts. The plates are made in six sizes and nine lengths of rivets allow them to be used for 2 to 8-ply transmission belts and conveyor belts up to 10-ply. Nibs at the center and end of each plate are used to align them across the belt and the rivets are aligned lengthwise of the belt by means of projections in the rivet holes. The plates are rust-proof and curved to fit the pulley and are said to distribute the strain evenly across the belt.



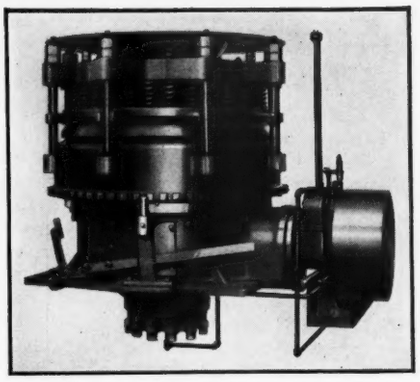
The Standard self-aligning belt fastener.

New Secondary Crusher With Spherical Head

The Smith Engineering Works, Milwaukee, Wis., has developed a new secondary crusher known as the Gyrasphere. This crusher, which is said to assure a cubical product with a minimum of oversize slabs and splinters, is made in three sizes, Nos. 24, 36, and 48, these numbers denoting the bottom diameters of the heads in inches. The No. 24 unit is rated to crush from 15 to 25 tons at ⅜-in. discharge, to 30 to 50 tons at 1-in. discharge. The No. 48 unit is rated at 85 to 120 tons with ¾-in. discharge to 170 to 210 tons at 1½-in. discharge. The power requirements of these crushers are 25-30, 50-75, and 75-125 hp., respectively. Each crusher can be adjusted to meet any sizing requirement within the range given above.

The crushing members consist of a spherical head fixed on a gyrating shaft and a concave ring. The head and ring are of manganese steel and the shaft is alloy steel. The head and shaft are carried on an eccentric with an anti-friction thrust bearing between them. The shaft rests within the eccentric which is bored at an angle to the crusher axis. The ring can be adjusted by means of a threaded collar and a segmental wedge-shaped ring screw which is turned by means of a horizontal adjusting lever.

The crushing head is impelled by both the gyrated shaft and a cam action produced by the eccentric and the thrust bearing. Because of the spherical shape of the head the greater part of the crushing action is produced



The Telsmith secondary gyratory crusher with spherical head.

by an upward thrust of the head, transmitting most of the pressure to the end-thrust anti-friction bearings. Material is discharged from the crusher through a three-arm spider, the chute being attachable in any desired position.

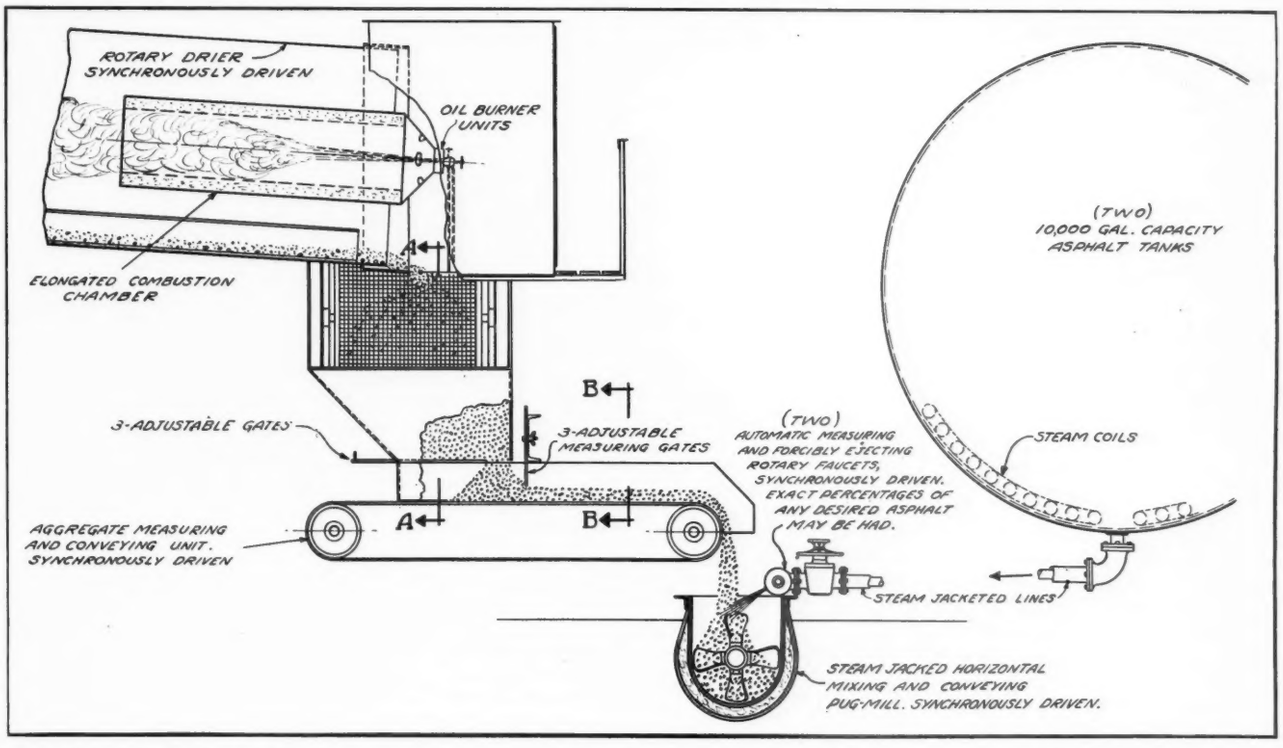
Vacuum Impregnation of Aggregate with Asphalt

The Heedicsite Co., Grand Rapids, Mich., has developed a method and system of mechanical apparatus for bituminizing mineral aggregate which, it is claimed, thoroughly impregnates the aggregate and makes it permanently water-proof. Patents on the methods and equipment used have been applied for and it is the intention of the company to have these plants operated by aggregate producers at their sources of supply. The system used was designed to be automatic and as free as possible from human error and to be able to operate continuously once the proper percentages of ingredients have been selected. The operation is synchronized throughout so that little attention is necessary after the original adjustments are made. Simplicity of operation and low cost were other considerations.

With this system the particles of mineral aggregate are first heated, thus expanding their structure, enlarging their interstices and expelling any moisture contained in them. They are then slowly cooled to about 150 deg. F., then rapidly cooled to expel the gaseous ether remaining in the interstices, and then again heated and impregnated with hot liquid asphalt which is driven into the interstices by atmospheric pressure. When the aggregate is allowed to cool the asphalt is permanently imprisoned in the particles, which are rendered permanently dry internally and free from any danger of disintegration due to the action of frost upon it. This thorough impregnation also results in a homogeneous bond between the superficial area of the particles and the asphalt binder, because there is just as much asphalt within the particles as can contact their superficial area. To prevent segregation of the aggregates and to keep the graded sizes properly distributed through the mass of the mixture they are screened to three sizes, which are handled separately and recombined before being impregnated and mixed.

The equipment consists of a rotary drier and agitator to which the aggregate is fed by a bucket-elevator. The drier has an elongated combustion chamber, a double oil-burner, and a draft fan. It dries the stone and discharges it to an inclined single-deck vibrating screen which has three sizes of openings. The three sizes of screen cloth are in separate removable sections allowing the screens to be adjusted to meet local conditions. The three sizes of aggregate are discharged to the three separate compartments of a small feed or surge hopper. These compartments discharge through adjustable gates to a short aggregate-measuring belt-conveyor, thus eliminating any possibility of segregation in handling. As the aggregate, already slightly cooled, drops from this conveyor to the 15-ft. long mixer or pug-mill it is exposed to a stream of cold asphaltic bitumen which issues from a rotary valve and quickly cools the aggregate, expelling the gaseous ether. At the approximate center of the pug-mill a stream of hot asphalt at a temperature of about 300 deg. F. is directed on the mixture from another valve. The last half of the pug-mill is inclosed by a steam jacket which keeps it at a temperature of about 300 deg. F. As a result, the aggregate particles again expand and the vacuum formed in the interstices, together with the atmospheric pressure, impregnates them thoroughly with bitumen.

Each valve is of the automatic-measuring and forcible-ejection type and each is supplied from a separate source. In the plant illustrated there are two 10,000-gal. tanks—one equipped with steam coils for furnishing hot asphalt, the other a plain tank for furnishing cold asphalt. The pug-mill discharges to a 30-ft. portable inclined flight-conveyor which loads trucks or cars for shipment. The plant has a capacity of 40 tons per hr. and has an overall length of 80 ft. and an over-all width of 25 ft. All operating units are driven through chains and sprockets by a single electric motor, internal-combustion engine, or other power source.


ROTARY DRIER SYNCHRONOUSLY DRIVEN
OIL BURNER UNITS
ELONGATED COMBUSTION CHAMBER
A
B
3-ADJUSTABLE GATES
3-ADJUSTABLE MEASURING GATES
(TWO) AUTOMATIC MEASURING AND FORCIBLY EJECTING ROTARY FAUCETS, SYNCHRONOUSLY DRIVEN. EXACT PERCENTAGES OF ANY DESIRED ASPHALT MAY BE HAD.
AGGREGATE MEASURING AND CONVEYING UNIT. SYNCHRONOUSLY DRIVEN
(TWO) 10,000 GAL. CAPACITY ASPHALT TANKS
STEAM COILS
STEAM JACKETED LINES
STEAM JACKED HORIZONTAL MIXING AND CONVEYING PUG-MILL. SYNCHRONOUSLY DRIVEN.

A drawing illustrating the simplicity of the Heedicsite system. All operations except the feed to the drier and the loading of the finished product are shown.

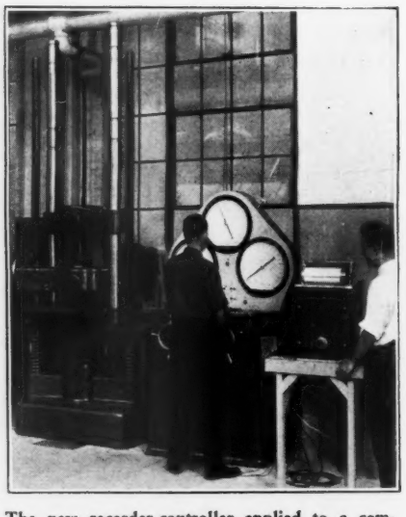
Pioneer Develops New Primary Jaw Crusher

The Pioneer Gravel Equipment Mfg. Co., Minneapolis, Minn., has developed a new force-feed jaw crusher for primary crushing. This crusher, known as the No. 2436, has a 24-in. by 36-in. jaw opening and has maximum and minimum jaw settings of 6-in. and 3-in., respectively. The eccentric shaft is of heat-treated chrome nickel steel, machined and ground, the jaws and cheek plates are of manganese steel, the base and pitman are of electric cast steel, and the pitman toggle seat is made of alloy steel.

The crusher adjusting mechanism is of the fully-enclosed ratchet type, the side bearings are of bronze, the lower half babbitted and the caps of the ring-oiling type. The bronze pitman bearing is of the splash oil type. All bearings have the patented Pioneer closures which prevent dirt from getting between them. This crusher has a total weight of 30,000 lb.

Recorder-Controller for Testing Machines

The Baldwin-Southwark Corp., Philadelphia, Pa., has developed what is known as the Southwark-Emery system of hydraulic load production and measurement involving the use of a recorder-controller for use with testing machines. This instrument combines an autographic stress-strain recorder which produces a graph up to incipient failure or which may, by adaptation, produce a graph up to and through failure on any material, and



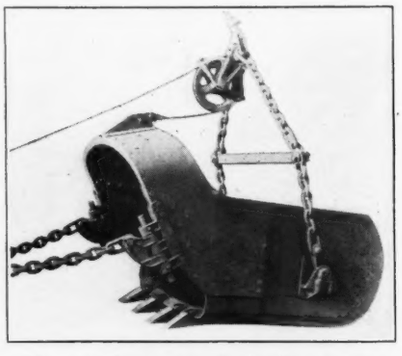
The new recorder-controller applied to a compression testing machine.

an instrument which is all of the above and in addition controls load application to effect constant rate of strain increment, constant rate of load increase and load maintenance at constant value. In spite of the range of control possible with this instrument it in no way limits manual control and such control is inherent up to any predetermined point at which the instrument takes over the control function and proceeds to exercise it to a point elected by the operator.

Basically these devices are combinations of the extensometer, the Bourdon tube, and the hydraulic valve, in combination with motors, relays, solenoids and mechanical clutches. The extensometer used in this instrument is fundamentally a micrometer screw in combination with a mechanical lever multiplying system.

New Page Automatic Bucket for Draglines

The Page Engineering Co., Chicago, Ill., has developed a new type of dragline bucket known as the "Page Automatic Bucket" which is said to have three distinct advantages over the old types. The forward-projecting sides have been almost completely eliminated, reducing the danger of damaging the bucket in dropping it. Elimination of these projecting sides has made it possible to dispense with the heavy reinforcing formerly required, resulting in a lighter bucket with no sacrifice of strength. This bucket, it is claimed, is in a digging position when it is lowered into a pit, saving dragging it a long distance before it fills, and also allowing digging beyond the point of the boom. Another characteristic claimed for this bucket is that it digs as effectively in a deep pit as on the surface. This is accomplished by an improved draft hitch with hitch plates which are adjustable to suit the nature of the digging.



The new Page automatic dragline bucket.

Meehanite Properties Described in Bulletin

The Meehanite Institute, Detroit, Mich., has issued a new bulletin giving the characteristics and physical and chemical properties of this metal compared to others in common use. An interesting graphical arrangement is used to compare these metals. The bulletin also includes magnified photographs of these various metals and additional data on Meehanite as well as a table giving the average operating life of Meehanite and other metals commonly used in numerous operating applications.

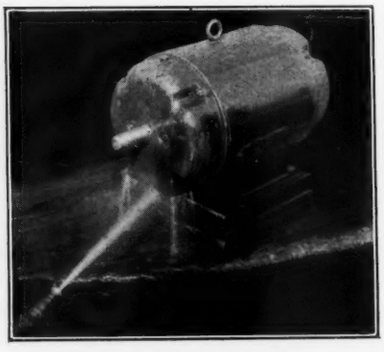
New Heavy-Duty Hoist Driven Through V-Belt

The C. H. & E. Mfg. Co., Inc., Milwaukee, Wis., makes a heavy-duty hoist which is said to be the first V-belt driven hoist on the market and which is suitable for dragline, clamshell-bucket handling, and general hoisting purposes. This hoist has an electrically-welded frame made of heavy structural shapes and has turned and ground drum shafts and countershafts running in heavy ball bearings. The drums are of ferro-steel, bronze-bushed, and the clutch and brake are of the external band type lined with asbestos molded blocks. The clutches are operated by a large screw and yoke with forged steel hand levers and steel ratchets and dogs operated by levers on the operator's side are provided for locking the load at any point.

The drive of this hoist consists of two sheaves and seven V-belts protected by a heavy wire-mesh and sheet-steel guard. This drive, together with the cut-steel drum gears and forged-steel pinion, make this hoist smooth and silent in operation. The No. 28 hoist will handle a 1-cu.yd. drag scraper and has a 12-in. front drum and a 30-in. rear drum. The No. 27 hoist is the same except that it has only one drum. Winch heads are furnished as standard equipment.

New Splash-Proof Motor Is Made in All Sizes

The Ideal Electric & Mfg. Co., Mansfield, O., has announced a splash-proof motor designed for use in places where water or other liquids may be splashed on the motor. Baffles placed in the air ducts of the motors remove all spray from the air entering them and keep the motor windings dry at all times. These motors are made in all sizes from 1 to 200 hp. as squirrel-cage induction motors meeting all classifications of torque and inrush requirements. They are also available as across-the-line start motors up to 200 hp. and can be supplied as unity (100 per cent.) or 80 per cent. leading-power-factor induction motors in all sizes.



The Ideal splash-proof motor.

Manufacturers' Publications

Copies of any of these publications may be had by writing the manufacturers who publish them. Please mention PIT & QUARRY *when writing.*

Air Compressors

Two-Stage Portable Air Compressors. 8 p. (Bull. No. 88-G, Sullivan Machinery Co., Chicago, Ill.) Describes and illustrates the new Sullivan 505-ft. V-type portable air compressor which has been brought out to meet a demand for a mobile compressor of large capacity.

Ingersoll-Rand Portable Compressors. 36 p. (Ingersoll-Rand Co., New York, N. Y.) Unusually attractive catalog describes the full line of Ingersoll-Rand two-stage, air-cooled portable compressors. Illustrations and specifications of the various models are presented and other illustrations show them in use for various purposes.

Crushers

Gyrasphere Crusher. 10 p. (Smith Engineering Works, Milwaukee, Wis.) Bulletin describes the new Telsmith Gyrasphere crusher which derives its name from its spherical steel crusher head.

Diesel Engines

Stationary Diesel Engines. 28 p. (Bull. No. 151, McIntosh & Seymour Corp., Auburn, N. Y.) Describes and illustrates the various types and sizes of McIntosh & Seymour Diesel engines in use in various industries, also giving some interesting historical data. A detailed description of the important engine parts is also included.

Dust Collectors

Multiclone Dust Collectors. 16 p. (Western Precipitation Co., Los Angeles, Cal.) Describes and illustrates the Multiclone and Polyclone dust collectors. Illustrates installations in various kinds of plants and includes specifications of the different sizes made.

Grinding

Raymond Roller Mills. 4 p. (Raymond Bros. Impact Pulverizer Co., Chicago, Ill.) Describes installation arrangement for making micron material with Raymond high-side roller mill and air-separating equipment.

Kilns

Rotary Kilns with Cooling Drum. 4 p. (Bull. XI. 1a. Fried. Krupp Grusonwerk, A.G., Magdeburg-Buckau, Germany.) Describes and illustrates the Krupp rotary kilns used in connection with cooling drums for sintering cement aggregates and for burning lime, magnesite, dolomite, etc.

High-Duty Shaft Kilns. 8 p. (Bull. XI. 2. Fried. Krupp Grusonwerk, A.G., Magdeburg-Buckau, Germany.) Describes and illustrates the high-duty shaft kiln designed especially for the cement and lime industries. In addition to a general and detailed description of this type of kiln and its important parts this bulletin describes applications, method of operation and design.

Vibrating Screens

Jigger Vibrating Screen. 4 p. (Productive Equipment Corp., Chicago, Ill.) Circular describes the new Jigger heavy-duty, safety vibrating screen which features controlled vibration and circle-throw action.

Hercules Model 60 Crawl Tractor. 4 p. (Hercules Co., Marion, O.) Folder illustrates the new Hercules Model 60 crawler tractor in use under difficult operating conditions.

Tractors

Caterpillar Diesel 75. (Caterpillar Tractor Co., Peoria, Ill.) Mailing piece describes the new Caterpillar Diesel 75 tractor with illustrations and specifications.

Pumpings from the Old Pit

Fifteen Years Ago

The Ohio Sand & Gravel Producers' Ass'n. was formed at Columbus, O., representatives of 30 producing companies being present. The officers elected were: President, F. D. Coppock, Greenville Gravel Co.; Vice president, R. E. Do Ville, Lake Sand & Gravel Co.; Secretary-treasurer, E. S. Warner, Akron Sand & Gravel Co. Guy C. Baker, of the Greenville Gravel Co., was appointed executive secretary.

* * *

The executive committee of the National Crushed Stone Ass'n met at the La Salle Hotel, Chicago, Ill., the main purpose of the meeting being to elect a permanent secretary. The man selected for this position was A. P. Sandles who was also secretary of the Ohio Macadam Ass'n.

Ten Years Ago

An editorial in PIT & QUARRY discussed the plans being made by a number of states to build state cement plants. The arguments used by those in favor of such programs, have a familiar sound, having to do with "cement trusts," price fixing, etc.

* * *

The Pittsburgh Plate Glass Co. began construction of its new 2,500-bbl. cement plant at Fultonham, O. The J. C. Buckbee Co. acted in the capacity of consulting engineers on this project.

According to the Dept. of the Interior the quantity of explosives sold in this country in 1922 exceeded the sales in 1921 by more than 16 per cent. Total sales amounted to 431,772,077 lb.

Five Years Ago

The International Cement Corp., New York City, purchased the Phoenix Portland Cement Co., with a plant at Nazareth, Pa., and the Warrior Cement Corp., with a plant at Demopolis, Ala. These additions brought the number of International plants up to 13 with a total annual productive capacity of 20,000,000 bbl.

* * *

One of the largest blasts ever exploded on the West coast was set off by the California Portland Cement Co., at its plant at Colton, Cal. About 95 tons of explosives were used and the stone brought down was estimated at about 750,000 tons.

Saving Through Safety

Cement Mills Maintain Safety-Work Leadership

UPSETTING all predictions and expectations, the mills of America's cement industry established in 1932 a record for safe operation second only to that of the peak year of 1930, according to a statement issued by the Portland Cement Assn.

Cement manufacture, officials point out, is always hazardous, with its great use of explosives, heavy grinding machinery, high temperatures, and other dangerous processes. The intermittent operation during 1932, forced by general industrial conditions, increased the factor of hazard, but exceptional care in the mills and factories successfully overcame the added hazards of operation.

The 1930 all-time record for safety in the cement industry showed 46 American mills operating without a single lost-time accident, the best previous record standing at 27. In 1932 43 mills operated in complete safety.

The special significance of the 1932 safety record was explained by J. B. John, veteran cement man and chairman of the association's Committee on Accident Prevention.

"Under normal conditions," said Mr. John, "with steady production, there is a momentum of safety built up. Workers acquire a steady habit of safe operation. But when that momentum is interrupted by periods of forced inactivity, men lose their safety habits. Hence, they must be especially careful and constantly alert, for slight mishaps in a cement mill can be serious, sometimes fatal."

Among the 43 plants which operated without accident during 1932, five qualified for first awards of the safety trophy given by the Portland Cement Assn. for accident-free operation. To win this first award—one of the most coveted honors in the whole field of accident prevention—plants must have been in operation for a full calendar year without a lost-time accident for any employee, and during that period clinker-burning must have been done for a total of not less than six months. The five plants which met these conditions in 1932 are: the Pennsylvania-Dixie Cement Corp. at Bath, Pa., the Alpha Portland Cement Co. at Martin's Creek, Pa., the Lehigh Portland Cement Co. at Union Bridge, Md., the Monarch Cement, Co. at Humboldt Kan., and the Lone Star Cement Co. at Dallas, Tex.

Large cast-stone safety trophies will be erected on the grounds of these five plants, with special ceremonies, during the next few months.

The other 38 accident-free cement mills, including 11 with a record of more than 1,000 consecutive days of safe operation, which qualified for reaward of their previously-won safety trophies, are reported as follows:

Canada Cement Co., Ltd.
Exshaw, Alta.; Port Colborne, Ont.; Fort Whyte, Man.; Hull, Que.; Belleville, Ont.
Universal-Atlas Cement Co.
Duluth, Minn.; Northampton, Pa.; Leeds, Ala.; Independence, Kan.; Pittsburgh, Pa.
Medusa Portland Cement Co.
Toledo, O.; Manitowoc, Wis.; York, Pa.
Lehigh Portland Cement Co.
Iola, Kan.; Sandt's Eddy, Pa.; Fogelsville, Pa.
Alpha Portland Cement Co.
Ironton, O.; Birmingham, Ala.
Pennsylvania-Dixie Cement Corp.
Kingsport, Tenn.; Portland Point, N. Y.
Southwestern Portland Cement Co.
El Paso, Tex.; Victorville, Cal.
Trinity Portland Cement Co.
Fort Worth and Dallas, Tex.
Ash Grove Lime & Cement Co.
Louisville, Neb.
Calaveras Portland Cement Co.
San Andreas, Cal.
Hercules Cement Corp.
Stockertown, Pa.
Lone Star Cement Co., Kansas.
Bonner Springs, Kan.
Lone Star Cement Co., Indiana.
Greencastle, Ind.
Lone Star Cement Co., Texas.
Houston, Tex.
Lone Star Cement Co., Virginia.
Norfolk, Va.
Lone Star Cement Co., Alabama.
Spocari, Ala.
Olympic Portland Cement Co.
Bellingham, Wash.
Oregon Portland Cement Co.
Oswego, Ore.
Spokane Portland Cement Co.
Irvin, Wash.
Superior Portland Cement Co.
Concrete, Wash.
Yosemite Portland Cement Co.
Merced, Cal.

Wolverine's 1932 Loss One Third Below 1931

The Wolverine Portland Cement Co. reports for the year ended Dec. 31, 1932, a net loss of $101,030 after charges, depreciation and depletion. This compares with a net loss of $157,331 in 1931. The report has been certified by independent auditors.

Large Loss in 1932 Is Shown by Warner Co.

Report of Warner Co. (sand and gravel business) and subsidiaries for year ended Dec. 31, 1932, certified by independent auditors, shows net loss of $1,019,875 after depreciation, depletion, interest and taxes. This compares with net income of $490,102, equivalent after dividends on first preferred stock, to $5.54 a share on 53,500 shares of $7 second preferred stock in 1931.

English Cement Profits Slightly Less Than 1931

Report of Associated Portland Cement Manufacturers, Ltd., for year ended Dec. 3, 1932, shows net profit of £385,800 after taxes, debenture interest, depreciation and provision for debenture stock redemption fund equivalent after dividend requirements on 5½ per cent. preference stock, to 7.09 per cent. on £3,500,000 ordinary stock. This compares with £399,963 or 7.50 per cent. on ordinary stock in 1931.

Large Loss Replaces Lehigh's Small Profit

The Lehigh Portland Cement Co. reports for the year ended Dec. 31, 1932, a net loss of $1,998,189 after taxes, depreciation, depletion and obsolescence. This compares with a net profit of $79,328, equivalent to 38c a share (par $100), on 204,969 shares of 7-per cent. preferred stock in 1931.

Lehigh Engineers' Club Holds Annual Meeting

The Engineers' Club of the Lehigh Valley held its annual meeting and election of officers at Bethlehem, Pa., recently. Among the officers for the coming year are: A. W. Heyman, Universal Atlas Cement Co., Northampton, president; R. N. Young, Lehigh Portland Cement Co., Allentown, vice-president, 1935; T. N. Haffner, Keystone Portland Cement Co., Bath, secretary.

Peerless Cement Asks Voluntary Dissolution

A petition for the voluntary dissolution of the Peerless Cement Corp. was recently filed in the circuit court in Detroit, Mich., by its officers and directors. It was stated that all of the corporation's property is pledged to secure a bonded indebtedness of $1,750,000. Judge Thomas J. Murphy set June 15 as the date for hearing of an order to show cause why the corporation should not be dissolved. The corporation was formed through a merger of the New Egyptian and Peerless Portland cement companies.

Eighteen tons per hour from a No. 19 Crusher—100% through three-eighth inch opening using less than fifteen horsepower

THE following is the result of a test on a No. 19 Kennedy Ball Bearing Gearless Crusher.

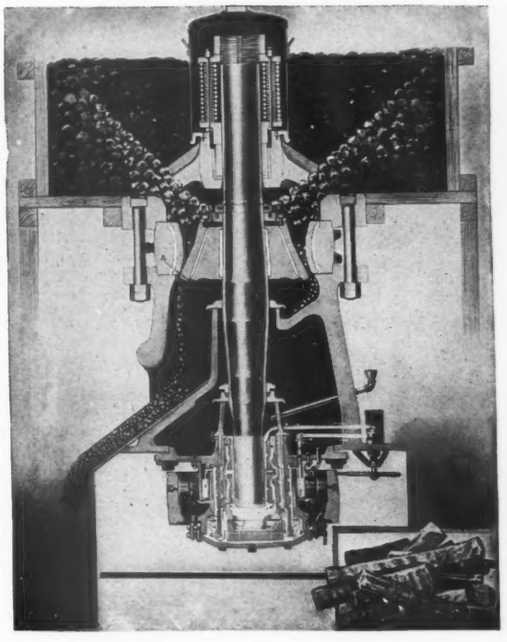
Exceedingly hard glacial gravel, 1½" and plus ⅜", was crushed for sand for concrete purposes, and less than fifteen horsepower was used.

The same crusher can be opened up and 1½" stone can be produced at a rate of from 30 to 50 tons per hour.

With the opening set to ⅛" on the closed side the following results were obtained:

Minus ⅜"	100 %
Plus 3 mesh	21½%
Minus 3—Plus 4	17 %
Minus 4—Plus 14	36½%
Minus 14—Plus 48	15 %
Minus 48—Plus 100	4 %
Minus 100	5½%

This was crushed at the rate of 18 tons per hour.



Built in various sizes with receiving openings from 1¾" to 14". Produces sizes from ⅛" to 3", with capacities up to 620 tons per hour on the larger sizes.

The Kennedy Ball Bearing Gearless Gyratory Crusher is guaranteed to do more crushing, size for size, of any given material, with less power consumption, than any crusher ever built. 90% Of the power input to motor is applied direct to breaking the rock between head and concaves. The head and shaft of the type "S" crusher is suspended on springs to permit tramp steel to pass through. The ball-and-socket eccentric is self-aligning. This crusher may be operated by a synchronous motor, built in the pulley of the crusher, or by belt from standard motor. This crusher takes one-half the power required for a geared crusher, and saves 80% in the cost of maintenance.

We manufacture a complete line of primary jaw and gyratory crushers, ball mills, rod mills, screening, elevating, and conveying equipment, etc. Complete information describing any or all of this machinery will be sent on request. *Send for latest information on our vibrating screen.*

KENNEDY-VAN SAUN MFG. and ENG. CORP.

Two Park Avenue **New York, N. Y.**

BRANCH OFFICES:—Chicago; 120 South La Salle St. Birmingham, Ala.; Comer Building. Los Angeles, Calif.; 416 South Spring St. London, England; Bush House. Paris, France; 40 Rue des Mathurins. Johannesburg, S. Africa; 73 Cullinan Bldg. Canadian Agents; The William Kennedy & Sons, Ltd., Owen Sound, Ont. Walkers Limited, Maryborough, Queensland, Australia. New Zealand Agents; Booth, MacDonald & Co., Ltd., Christchurch.

Classified Buyers' Guide

A Directory of Pit and Quarry Advertisers Arranged According to Product

Although every effort is made to insure accuracy and completeness in these listings, the publisher cannot accept responsibility for errors or omissions. Any mistakes discovered will gladly be rectified, if brought to the attention of the Advertisers' Service Department.

Index to Advertisers on Page 64

Aggregate Bituminizing Plants
Heedicsite Co.

Agitating Ladders (Dredge)
Eagle Iron Works

Air-Filters
Blaw-Knox Co.

Air Separators
Gay, Rubert M.
Universal Road Machinery Co.

Ash and Refuse-Handling Equipment
Haiss Mfg. Co., Geo.
Link-Belt Co.

Automatic Feeders
Link-Belt Co.

Automatic Weighers
Blaw-Knox Co.

Balls (Grinding)
Kennedy-Van Saun Mfg. and Eng. Corp.

Balls (Tube-Mill, etc.)
Allis-Chalmers Mfg. Co.
Kennedy-Van Saun Mfg. and Eng. Corp.

Bearings (Anti-Friction)
Link-Belt Co.
Sprout, Waldron & Co.

Belt Fasteners
Flexible Steel Lacing Co.

Belting
Goodyear Tire & Rubber Co., Inc.
Haiss. Mfg. Co., Geo.
Link-Belt Co.
Sprout, Waldron & Co.

Belt Lacing
Flexible Steel Lacing Co.

Bin Gates
Allis-Chalmers Mfg. Co.
Haiss Mfg. Co., Geo.
Hendrick Mfg. Co.
Kennedy-Van Saun Mfg. and Eng. Corp.
Link-Belt Co.
McLanahan and Stone Corp.
Morrow Mfg. Co.
Smith Engineering Works
Sprout, Waldron & Co.

Bins (Steel)
Blaw-Knox Co.
Hendrick Mfg. Co.
Kennedy-Van Saun Mfg. and Eng. Corp.
McLanahan and Stone Corp.
Pioneer Gravel Equip. Mfg. Co.
Sprout, Waldron & Co.

Blast-Hole Drills (See Drills—Blast-Hole)

Blasting Machines
Hercules Powder Co.

Blasting Supplies
Ensign-Bickford Co.
Hercules Powder Co.

Block Machines (Concrete)
Concrete Equipment Co.
Miles Mfg. Co.

Blocks (Sheave)
Sauerman Bros., Inc.
Sprout, Waldron & Co.

Bodies (Motor Truck, Concrete Mixing)
Blaw-Knox Co.
Jaeger Machine Co.

Borings, Core
Pennsylvania Drilling Co.
Sprague and Henwood Inc.

Brick Machines (Concrete)
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Miles Mfg. Co.

Bronze Work (Ornamental)
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Bucket Elevators (See Conveyors and Elevators)

Buckets (Clamshell, Orange-Peel, Etc.)
Blaw-Knox Co.
Haiss Mfg. Co., Geo.
Link-Belt Co.

Buckets (Dragline—Cableway)
Link-Belt Co.
Pioneer Gravel Equip. Mfg. Co.
Sauerman Bros., Inc.

Buckets (Elevator and Conveyor)
Haiss Mfg. Co., Geo.
Hendrick Mfg. Co.
Link-Belt Co.
McLanahan and Stone Corp.
Pioneer Gravel Equip. Mfg. Co.
Smith Engineering Works
Sprout, Waldron & Co.

Bulk-Cement Storage Plants
Sprout, Waldron & Co.

Cableways
American Steel & Wire Co.
Link-Belt Co.
Sauerman Bros., Inc.

Caps (Blasting)
Hercules Powder Co.

Capstans (See Winches and Capstans)

Car Dumpers
Link-Belt Co.

Car Pullers
Link-Belt Co.

Carriers
Link-Belt Co.
Smith Engineering Works
Sprout, Waldron & Co.

Car Wheels—(See Wheels—Car)

Castings
Eagle Iron Works
Kennedy-Van Saun Mfg. and Eng. Corp.
Link-Belt Co.
McLanahan and Stone Corp.
Sprout, Waldron & Co.

Cement Pumps (See Pumps; Air Pumps; Pumps, Cement Slurry; Pumps, Bulk Cement)

Central Concrete-Mixing Plants (Complete)
Sprout, Waldron & Co.

Chain Drives
Link-Belt Co.

Chain (Elevating and Conveying)
Haiss Mfg. Co., Geo.
Link-Belt Co.
Sprout, Waldron & Co.

Chutes and Chute Liners
Goodyear Tire & Rubber Co., Inc.
Hendrick Mfg. Co.
McLanahan and Stone Corp.
Morrow Mfg. Co.
Sprout, Waldron & Co.

Clamshell Buckets (See Buckets—Clamshell, Orange-peel, etc.)

Clamshell Gates (See Gates-Clamshell)

Classifiers
Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machine Co.
Link-Belt Co.

Clips (Wire Rope)
American Steel & Wire Co.

Clutches
Link-Belt Co.
Sprout, Waldron & Co.

Coal-Pulverizing Equipment
Allis-Chalmers Mfg. Co.
Gay, Rubert M.
Kennedy-Van Saun Mfg. and Eng. Corp.
Universal Road Machinery Co.

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Link-Belt Co.
Smith Engineering Works

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Conveyor Idlers and Rolls
Link-Belt Co.

Conveyors and Elevators
Allis-Chalmers Mfg. Co.
Haiss Mfg. Co., Geo.
Hendrick Mfg. Co.
Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
Link-Belt Co.
McLanahan and Stone Corp.
Morrow Mfg. Co.
Pioneer Gravel Equip. Mfg. Co.
Smith Engineering Works
Sprout, Waldron & Co.
Universal Road Machinery Co.

Conveyors (Ready-Mixed Concrete)
Blaw-Knox Co.
Jaeger Machine Co.

Coolers (See Kilns and Coolers—Rotary)

Couplings (Flexible and Shaft)
Erie Pump and Engine Works
Link-Belt Co.
Sprout, Waldron & Co.

Cranes (Crawler and Locomotive)
Bay City Shovels, Inc.
Link-Belt Co.

Crusher Parts
Kennedy-Van Saun Mfg. and Eng. Corp.
McLanahan and Stone Corp.

Crushers (Cone)
Nordberg Mfg. Co.

Crushers (Hammer)
Allis-Chalmers Mfg. Co.
Kennedy-Van Saun Mfg. and Eng. Corp.

Crushers (Jaw and Gyratory)
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Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
Nordberg Mfg. Co.
Pioneer Gravel Equip. Mfg. Co.
Smith Engineering Works
Universal Road Machy. Co.

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Allis-Chalmers Mfg. Co.
Kennedy-Van Saun Mfg. and Eng. Corp.
Link-Belt Co.
McLanahan and Stone Corp.
Pioneer Gravel Equip. Mfg. Co.

Crushers (Rotary)
Allis-Chalmers Mfg. Co.

Crushing Rolls
Allis-Chalmers Mfg. Co.
Kennedy-Van Saun Mfg. and Eng. Corp.
Link-Belt Co.
McLanahan and Stone Corp.

Detonators
Hercules Powder Co.

Diesel Engines (See Engines—Diesel)

Dippers and Teeth (Power Shovel)
Bay City Shovels, Inc.

Dragline Cableway Excavators
Link-Belt Co.
Sauerman Bros., Inc.

Dragline Excavators
Bay City Shovels, Inc.
Link-Belt Co.
Sauerman Bros., Inc.

Dredge Chain (See Chain)

Dredge Pipe (See Pipe)

Dredges
Morris Machine Works

Drilling Accessories
Loomis Machine Co.

Drilling Contractors
Pennsylvania Drilling Co.
Sprague and Henwood Inc.

Drills (Blast-Hole)
Loomis Machine Co.

Drills, Diamond
Pennsylvania Drilling Co.
Sprague and Henwood Inc.

Drills (Rock)
Loomis Machine Co.

Drills (Well) (See Drills—Blast-Hole)

Drives (Multiple, Belt, Chain, Rope)
Allis-Chalmers Mfg. Co.

Dryers
Allis-Chalmers Mfg. Co.
Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdry. & Mach. Co.
McLanahan and Stone Corp.

Dust Arrestors
Blaw-Knox Co.

Dust-Collecting Systems
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.

Dust Hoods and Helmets
Pulmosan Safety Equipment Co.

Dynamite (See Explosives)

Electrical Equipment
Allis-Chalmers Mfg. Co.

Elevator Belting (See Belting)

Elevators (See Conveyors and Elevators)

Engineers
Allis-Chalmers Mfg. Co.
Kennedy-Van Saun Mfg. and Eng. Corp.
McLanahan and Stone Corp.
Sprout, Waldron & Co.

Engines (Diesel)
Nordberg Mfg. Co.

Engines (Internal-Combustion)
Nordberg Mfg. Co.

Engines (Steam)
Morris Machine Works
Nordberg Mfg. Co.

Excavating Machinery (See Shovels; Cranes; Buckets; etc.)

Excavators—Shallow Grading (Bucket Elevator Type)
Haiss Mfg. Co., Geo.

Explosives
Hercules Powder Co.

Fans (Exhaust)
Kennedy-Van Saun Mfg. and Eng. Corp.

Feeders
Allis-Chalmers Mfg. Co.
Kennedy-Van Saun Mfg. and Eng. Corp.
Link-Belt Co.
Morrow Mfg. Co.
Pioneer Gravel Equip. Mfg. Co.
Smith Engineering Works
Sprout, Waldron & Co.

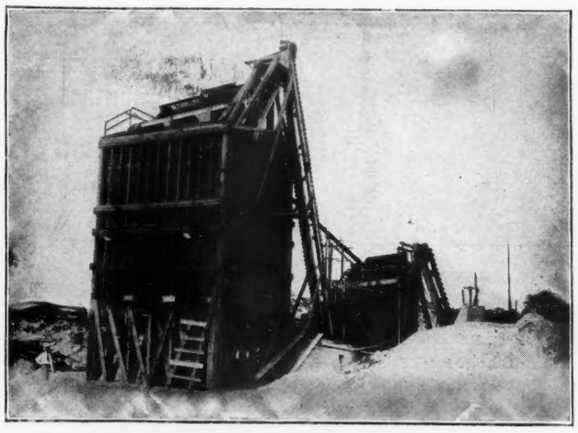
Fuses (Detonating)
Ensign-Bickford Co.
Hercules Powder Co.

Gaskets
Goodyear Tire & Rubber Co., Inc.

Gasoline Engines (See Engines—Internal-Combustion)

Gates (Bin) (See Bin Gates)

Gates (Clamshell)
Haiss Mfg. Co., Geo.



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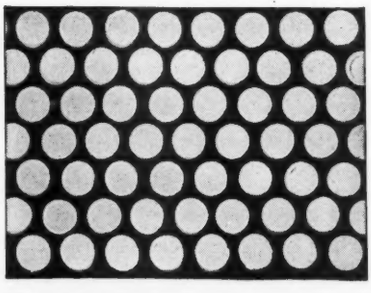

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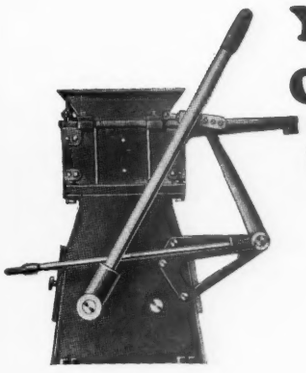

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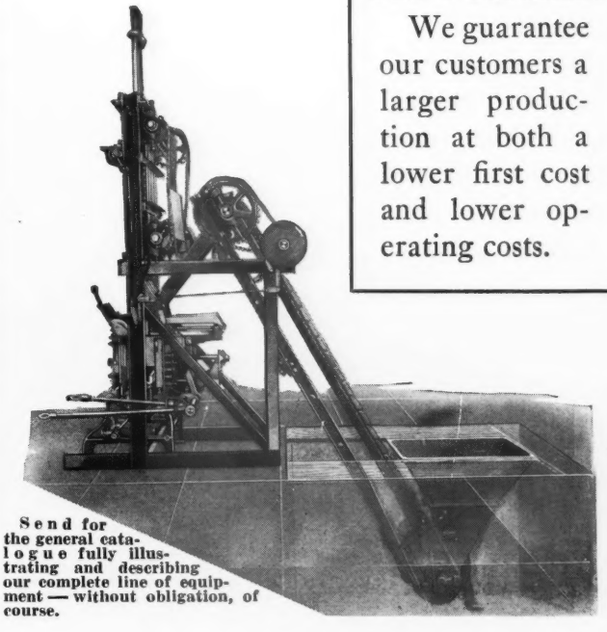

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Classified Buyers' Guide

A Directory of Pit and Quarry Advertisers Arranged According to Product

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Gears and Pinions
Haiss Mfg. Co., Geo.
Link-Belt Co.
Sprout, Waldron & Co.

Gears (Herringbone)
Link-Belt Co.
Sprout, Waldron & Co.

Gelatin (See Explosives)

Generators (See Motors and Generators)

Glass Sand Equipment
Lewistown Foundry & Machine Co.

Goggles
Pulmosan Safety Equipment Co.

Grab Buckets (See Buckets—Clamshell, Orange-Peel, etc.)

Grating (Steel)
Blaw-Knox Co.
Hendrick Mfg. Co.

Grinding Balls (See Balls, Grinding)

Grizzlies
Allis-Chalmers Mfg. Co.
Eagle Iron Works
Hendrick Mfg. Co.
Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdy. & Mach. Co.
Smith Engineering Works
Universal Road Machy. Co.

Guards (Wire)
National Wire Cloth Co.

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Georgia Iron Works

Hammer Mills (See Crushers—Hammer)

Hoists
Link-Belt Co.
McLanahan and Stone Corp.
Pioneer Gravel Equip. Mfg. Co.
Sauerman Bros., Inc.
Smith Engineering Works
Sprout, Waldron & Co.

Hoppers
Hendrick Mfg. Co.

Hose (Air, Steam and Water)
Goodyear Tire & Rubber Co., Inc.

Hose Couplings (See Couplings)

Hydraulic Guns (See Guns—Hydraulic)

Idlers
Allis-Chalmers Mfg. Co.
Link-Belt Co.
Smith Engineering Works
Sprout, Waldron & Co.

Kilns and Coolers (Rotary)
Allis-Chalmers Mfg. Co.
Kennedy-Van Saun Mfg. and Eng. Corp.

Lime-Handling Equipment
Link-Belt Co.

Lime Kilns
Kennedy-Van Saun Mfg. and Eng. Corp.

Linings (Ball- and Tube-Mill) (See Mill Liners and Linings)

Loaders and Unloaders
Haiss Mfg. Co., Geo.
Link-Belt Co.
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Sprout, Waldron & Co.

Motors and Generators
Allis-Chalmers Mfg. Co.

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American Steel & Wire Co.

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Packing
Goodyear Tire & Rubber Co., Inc.

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National Wire Cloth Co.

Perforated Metal Plates
Chicago Perforating Co.
Hendrick Mfg. Co.
Morrow Mfg. Co.
Sprout, Waldron & Co.

Pipe Flanges
Georgia Iron Works

Plug Valves (See Valves)

Pneumatic Drills (See Drills, Rock)

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Haiss Mfg. Co., Geo.
Link-Belt Co.
Sprout, Waldron & Co.

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Pioneer Gravel Equip. Mfg. Co.

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American Steel & Wire Co.

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Pulleys (Magnetic)
Sprout, Waldron & Co.

Pulleys (Wing)
Sprout, Waldron & Co.

Pulverized Fuel Systems
Gay, Rubert M.
Kennedy-Van Saun Mfg. and Eng. Corp.
Universal Road Machinery Co.

Pulverizers (See also Crushers; Mills; etc.)
Allis-Chalmers Mfg. Co.
Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.

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Pumps (Cement Slurry)
Morris Machine Works

Pumps (Centrifugal)
Allis-Chalmers Mfg. Co.
Erie Pump and Engine Works
Georgia Iron Works
Morris Machine Works

Pumps (Dredging)
Allis-Chalmers Mfg. Co.
Erie Pump and Engine Works
Georgia Iron Works
Morris Machine Works

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Allis-Chalmers Mfg. Co.
Erie Pump and Engine Works
Georgia Iron Works
Morris Machine Works

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Safety Equipment
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Link-Belt Co.
McLanahan and Stone Corp.
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Smith Engineering Works

Sand-Settling Tanks
Link-Belt Co.
Pioneer Gravel Equip. Mfg. Co.
Smith Engineering Works

Scrapers (Power Drag)
Link-Belt Co.
Pioneer Gravel Equip. Mfg. Co.
Sauerman Bros., Inc.

Screens
Allis-Chalmers Mfg. Co.
Chicago Perforating Co.
Deister Machine Co.
Eagle Iron Works
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Haiss Mfg. Co., Geo.
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National Wire Cloth Co.
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Screens (Vibrating or Shaking)
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Lewistown Foundry & Machinery Co.
Link-Belt Co.
McLanahan and Stone Corp.
Pioneer Gravel Equip. Mfg. Co.
Sprout, Waldron & Co.
Universal Road Machinery Co.

Separators (Air) (See Air Separators)

Sheaves
Allis-Chalmers Mfg. Co.
Eagle Iron Works
Haiss Mfg. Co., Geo.
Link-Belt Co.
McLanahan and Stone Corp.
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Shovels (Electric, Internal Combustion and Steam)
Bay City Shovels, Inc.
Link-Belt Co.

Skip Hoists and Skips
Allis-Chalmers Mfg. Co.
Link-Belt Co.

Speed Reduction Units
Link-Belt Co.

Spouts (See Chutes and Chute Liners)

Sprockets and Chain
Link-Belt Co.
Sprout, Waldron & Co.

Steel Grating (See Grating, Steel)

Steel Inclines (See Inclines, Steel)

Steel Plate Construction
Hendrick Mfg. Co.
Sprout, Waldron & Co.

Storage Equipment
Haiss Mfg. Co., Geo.
Link-Belt Co.
Sauerman Bros., Inc.

Tanks
Hendrick Mfg. Co.

Tanks (Sand-Settling)
Link-Belt Co.
Morrow Mfg. Co.
Pioneer Gravel Equip. Mfg. Co.
Smith Engineering Works

Tools (Drill) (See Drilling Accessories)

Track Shifters
Nordberg Mfg. Co.

Tractors
Allis-Chalmers Mfg. Co.

Trailers
Bay City Shovels, Inc.

Tramways (Aerial)
American Steel & Wire Co.

Transformers
Allis-Chalmers Mfg. Co.

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Transmission Machinery
Allis-Chalmers Mfg. Co.
Link-Belt Co.

Trippers
Link-Belt Co.

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Blaw-Knox Co.
Jaeger Machine Co.

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Allis-Chalmers Mfg. Co.

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Link-Belt Co.

Variable Speed Reducers or Transmissions
Link-Belt Co.

Vibrating Screen Plate
Chicago Perforating Co.
Hendrick Mfg. Co.
Morrow Mfg. Co.

Vibrating Screens (See Screens—Vibrating)

Washers (Sand, Gravel, and Stone)
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Haiss Mfg. Co., Geo.
Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
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Pioneer Gravel Equip. Mfg. Co.
Smith Engineering Works
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Blaw-Knox Co.

Well Drills (See Drills—Well)

Wheels (Car)
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Williamsport Wire Rope Co.

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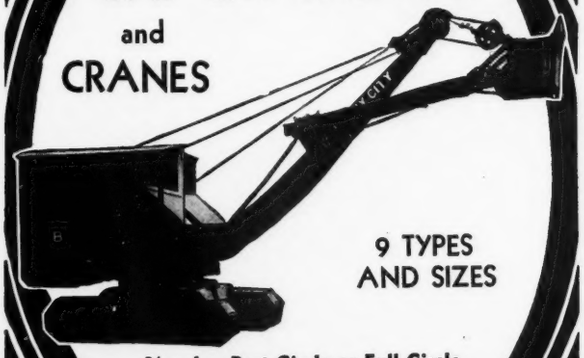

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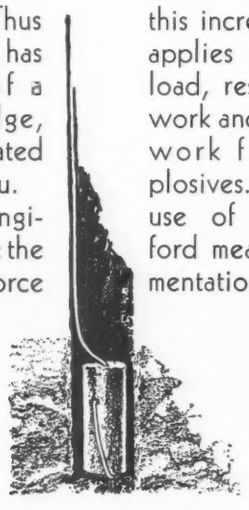

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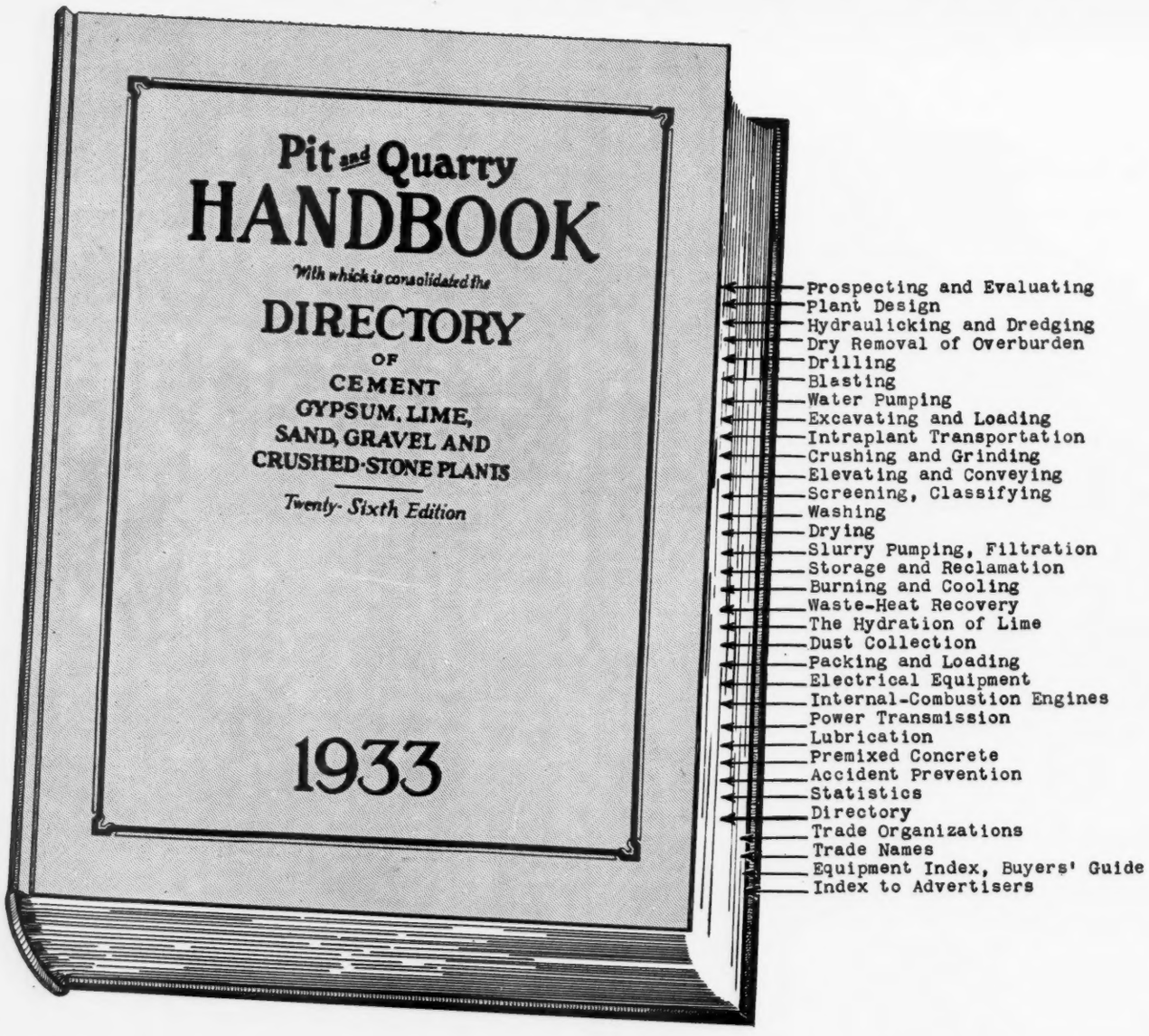

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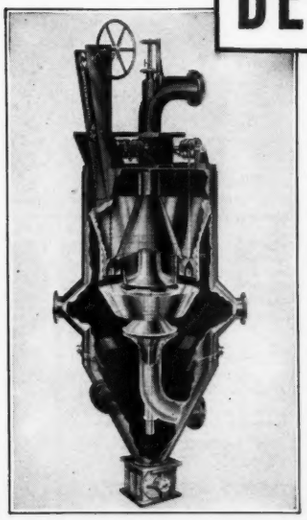

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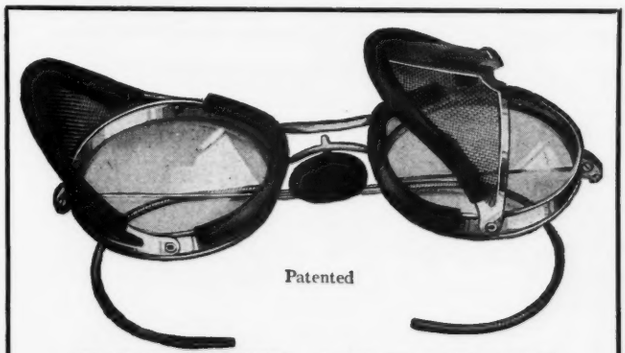

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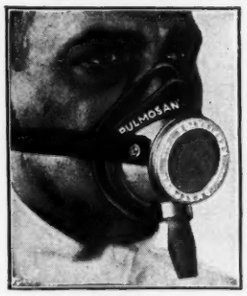

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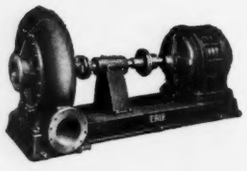

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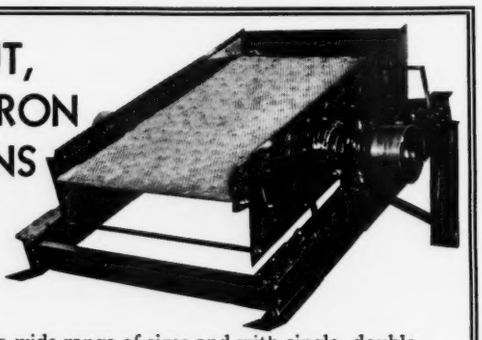

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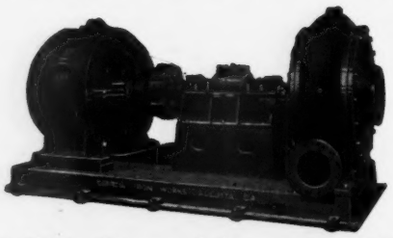

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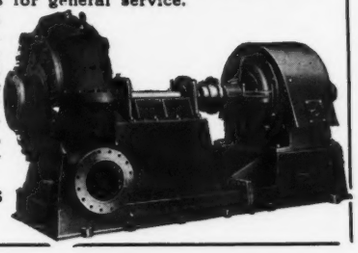

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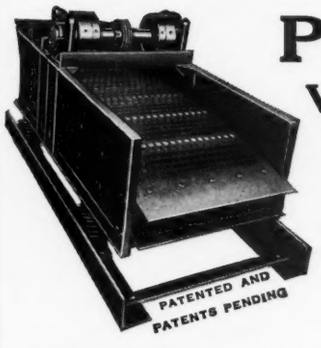

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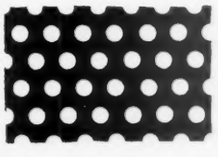

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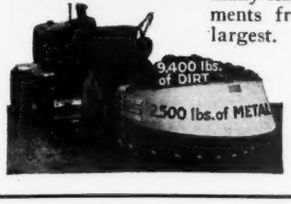

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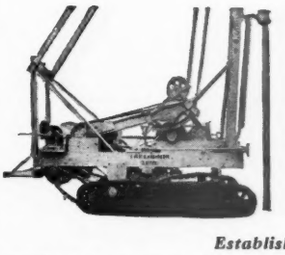

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1-200	Wsthse.	440	Slip Ring	500
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Flat Cars 10-24'' ga-deck 20 ft. x 5' 7'' wide.
A. V. Konsberg, 111 W. Jackson Blvd., Chicago

WANTED

Used Hammer Mill for Limestone reduction. Capacity 35 to 50 tons hourly passing ⅝" screen, feed 5" to 6". Reply full details and where can be inspected.

BOX 338, EVERETT, PA.

CORE BORINGS
DIAMOND DRILLING

Sprague & Henwood, Inc.
225 W. Olive St. Scranton, Pa.

VERY REASONABLE

3 MILES GOOD USED 2" PIPE
2 MILES GOOD USED 2½" PIPE
MOTORS, PUMPS, SCREENS, CRUSHERS, ELEVATORS, CONVEYORS

THE W. T. WALSH EQUIPMENT CO.
12500 Berea Road CLEVELAND, OHIO

WANTED

Used crushing rolls from 24" x 12" to 36" x 16".

STANDARD GRAVEL CO.
Pontiac, Mich.

Dryer—Vulcan Rotary 6' x 60' x 7/16", complete.
Crushers—Allis-Chalmers Gates Gyr. 8K & 4K.
Crusher—Allis-Chalmers 36'' x 16'' ROLLS.
Crushers—Hammer, Wms. No. 6 Reg. and No. 6 Jumbo—Penn. S-7.
Pulverizer—Fuller-Lehigh 33''.
Shovel—Elec. Thew 1½ Yd. S. Ga. 1 Yd. dipper.
Goodman M/G Mining Shovel No. 48 Elect. Travel.
Locos.—Steam S. Ga. 50 ton & 87 ton.

WILL TRADE
IRON & STEEL PRODUCTS, Inc.
Railway Exchange Chicago, Ill.

Rubber Conveyor Belt 18'' wide, 5 ply, ⅛'' rubber top, 73 ft. and 30 ft. long, 65c per ft.
4-L Jaeger Mixer, fine condition, with unloader, $150.00.
48x48 Pond Planer x 20', $800.00.
Full line of machine shop equipment.

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ELYRIA, OHIO.

WANTED

Two units, W. S. Tyler Mfg. Co. Hummer Screen, either 3'x5' or 4'x5', located preferably in Eastern Ohio or Western Pennsylvania.

J. B. WHITE & COMPANY
Box 84 Barre, Pa.

FOR SALE

Osgood 1-yard gas crawler shovel, overhauled.
Locomotives: 75-ton switcher code boiler; also saddle tank type, narrow and standard gauge.
CARS: side dump 12-yard; 50-ton steel twin hopper cars, etc.
Large stock Railroad and Contractors equipment.

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Atlanta, Ga.

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CRUSHING ROLLS

Two Garfield Type Roll Crushers, 16"x42", splendid condition, oversize chrome steel shells, complete with countershaft, pulleys, belts, motor, starter and Westinghouse V-belt drive.

CALROCK ASPHALT COMPANY
525 Market St. San Francisco, Calif.

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Used gyratory crusher with capacity of from 50 to 75 tons per hour to crush gravel from 3" to 1¼".

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208 W. Washington St., Chicago, Ill.

PORTABLE CRUSHING PLANT

Good Roads-Champion CRUSHERMOBILE, self propelled, rubber tired, combined road gravel crushing, screening and loading plant with built-in Waukesha motor, 10''x30'' crusher, return conveyor circuit, capacity 30 cu. yds. hr.; wt. 15 tons, used one season, overhauled, fine condition, easily moved, modern money making plant, cost $11,000; now $6400.

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241 E. Erie St. Milwaukee, Wis.

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1 Sauerman slackline cableway, 2 yard capacity, including bucket, electric two speed hoist, steel mast, blocks and operating cables, roller bearing equipped. Used three months, good as new. Price very low.

The Queen City Supply Co.
Pearl and Elm Sts. Cincinnati, Ohio
Telephone: Cherry 7160

FOR SALE The Bruns Hydrated Lime Company plant Woodville, Ohio. This six kiln lime plant, situated on approximately 180 acres of land with an excellent quarry is now under option for sale. This option will expire at midnight July 3rd. Unless the option is exercised the plant will be

FOR SALE AT PUBLIC AUCTION

10 A. M. July 10, 1933,

sale to be held at the plant. For further information apply to

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SWEDISH HOLLOW DRILL STEEL
GUARANTEED 100% PERFECT

Considerably below market prices.
20 ton ⅞-in. Hexagon.
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STAUNTON, VA.

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5 and 10 Ton
Holt Caterpillar Tractors

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Prices

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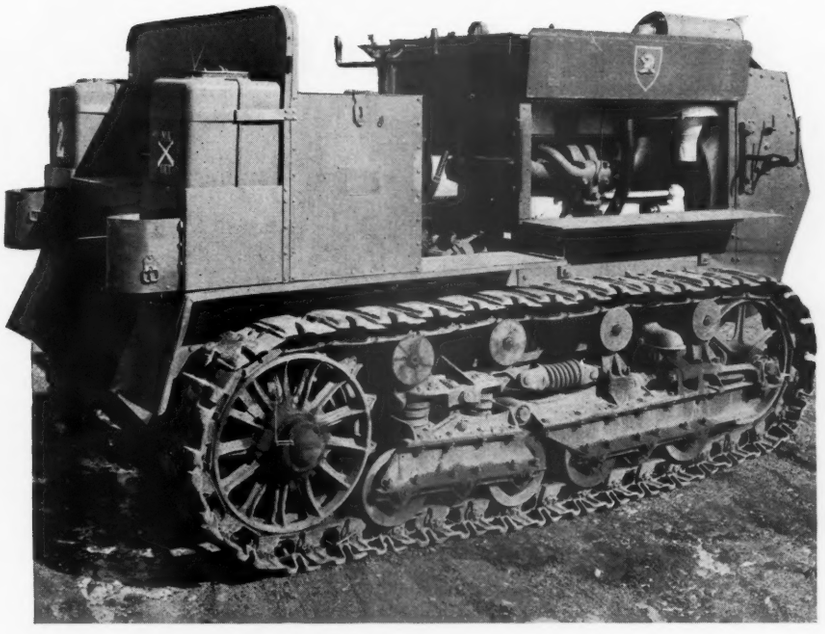

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REBUILT Block, Brick and Tile machines, Mixers — Pallets — Power Tampers and all accessories used for the manufacture of Concrete Bldg. Units.

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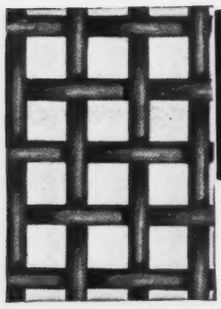

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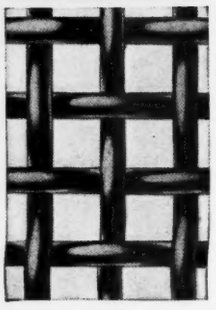

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142nd St. and Rider Ave., NEW YORK

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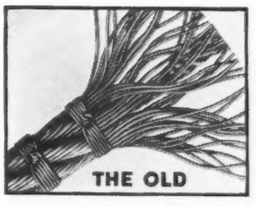
• Hold your pencil as tightly as you can, and see how quickly your hand cramps up. "I.T." (internal tension) soon fatigues your muscles.

• *Non*-preformed wire rope is full of cramps when you get it . . . and full of cramps as long as you use it; because each wire is a rope muscle, held in place under extreme tension, wires and strands being forcibly held in their helical shapes.



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THEN RELAX AND WRITE

• Relaxed you can write a long time without fatigue. TRU-LAY Preformed Wire Rope is similarly relaxed. "I.T." (internal tension) is eliminated by giving the strands and wires their final helical shape *before* assembling the strands together in the completed rope structure.

• Preforming gives perfect strand balance—which means that each strand carries an equal share of the load and wear. You won't find that one strand will hump up because it isn't loaded enough . . . or a strand pulled down into the rope for the reason that it is overloaded.

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PREFORMED

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Be "HARD-BOILED"

. . . in your wire rope purchases. We welcome inquiries from men who know what they want and want to be shown. We have convinced hundreds of these so-called "hard-boiled," shrewd and careful buyers.

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Let us recommend a TRU-LAY Preformed Wire Rope for your needs. We have ample proof that we can reduce your wire rope costs just as we have done in hundreds of instances

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THE MARK FOR GENUINE AMERICAN WIRE ROPE

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To any height—Over any area—At any point
With no structures in the piles
All material reclaimable
In Summer and Winter
With low operating cost
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Dependability with long life—in fact
The only way you should store

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